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Chemical Weekly

VOL. XXXV OCTOBER 10, 1989 NO. 5

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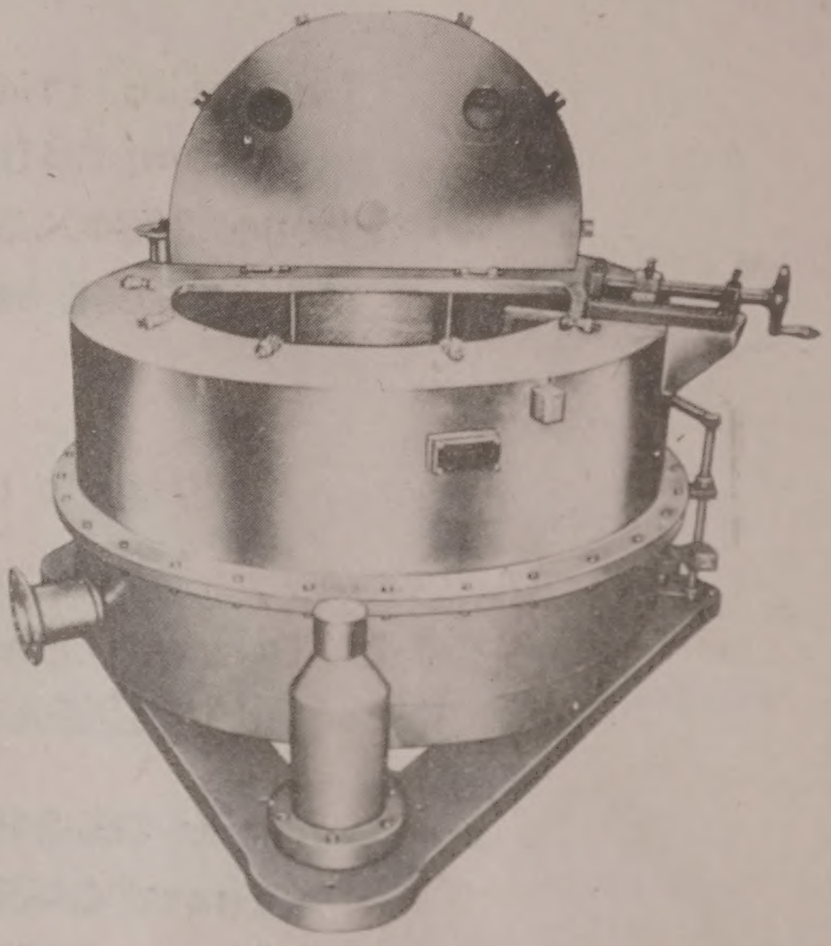

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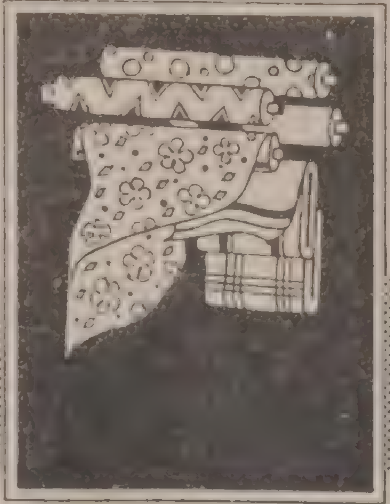

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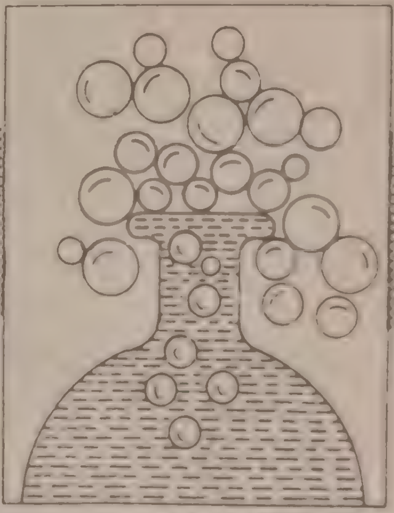

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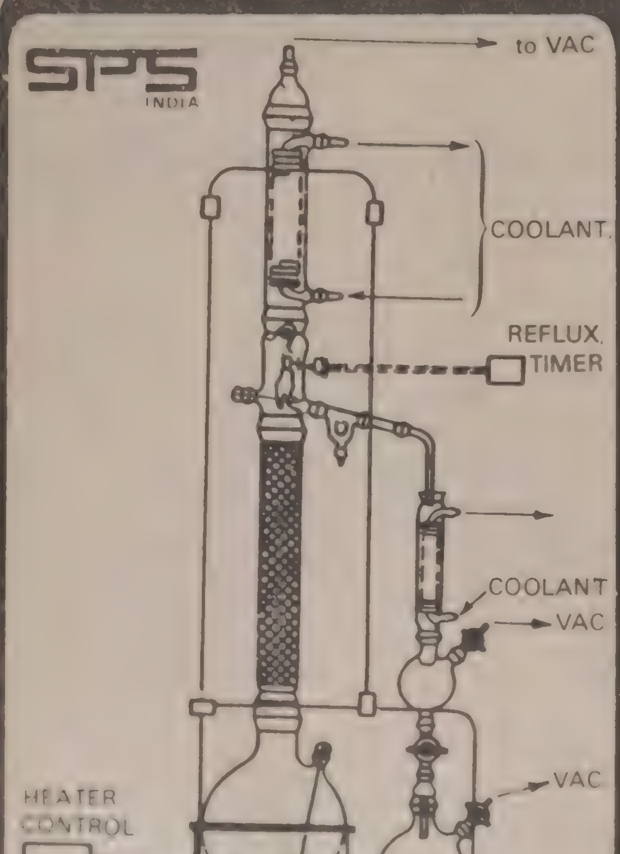

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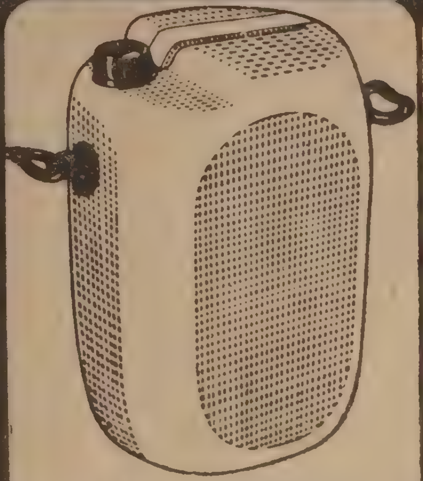
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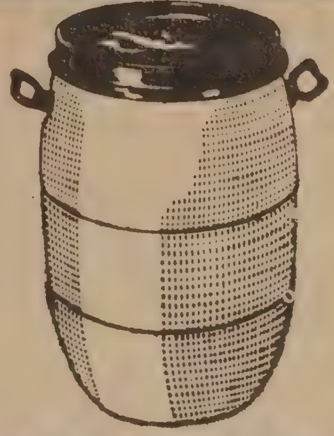
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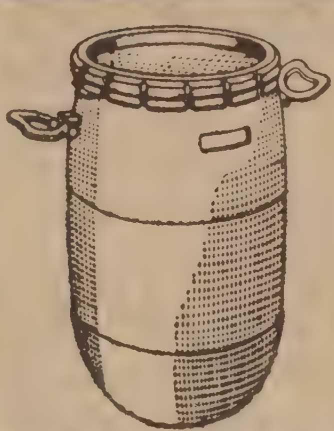
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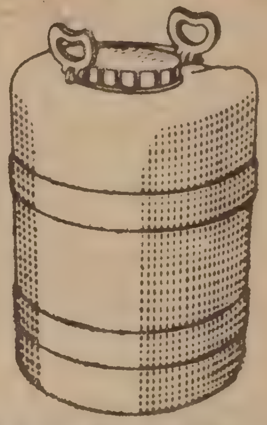
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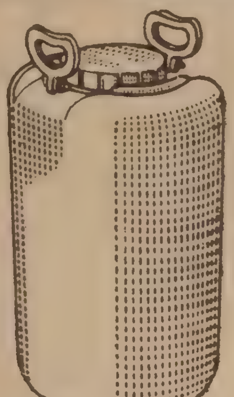
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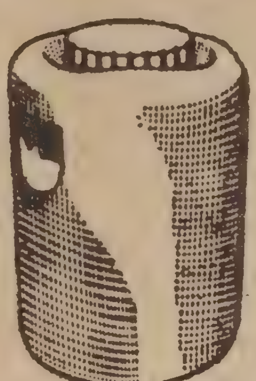
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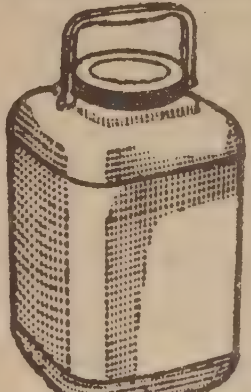
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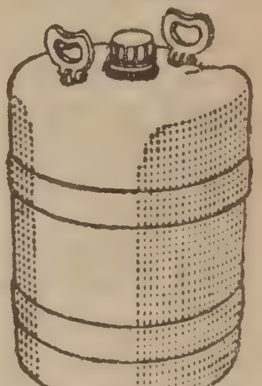
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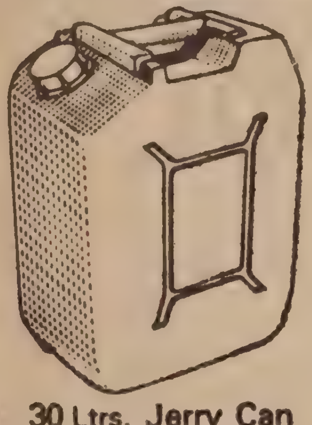
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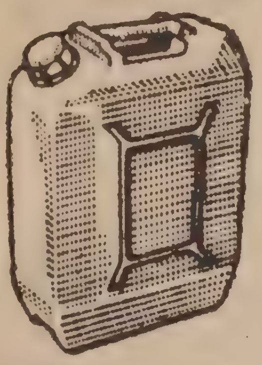
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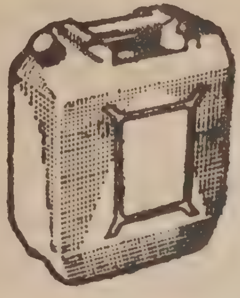
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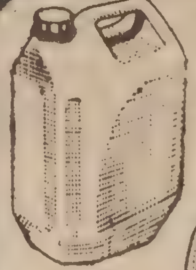
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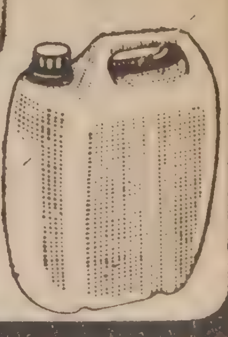
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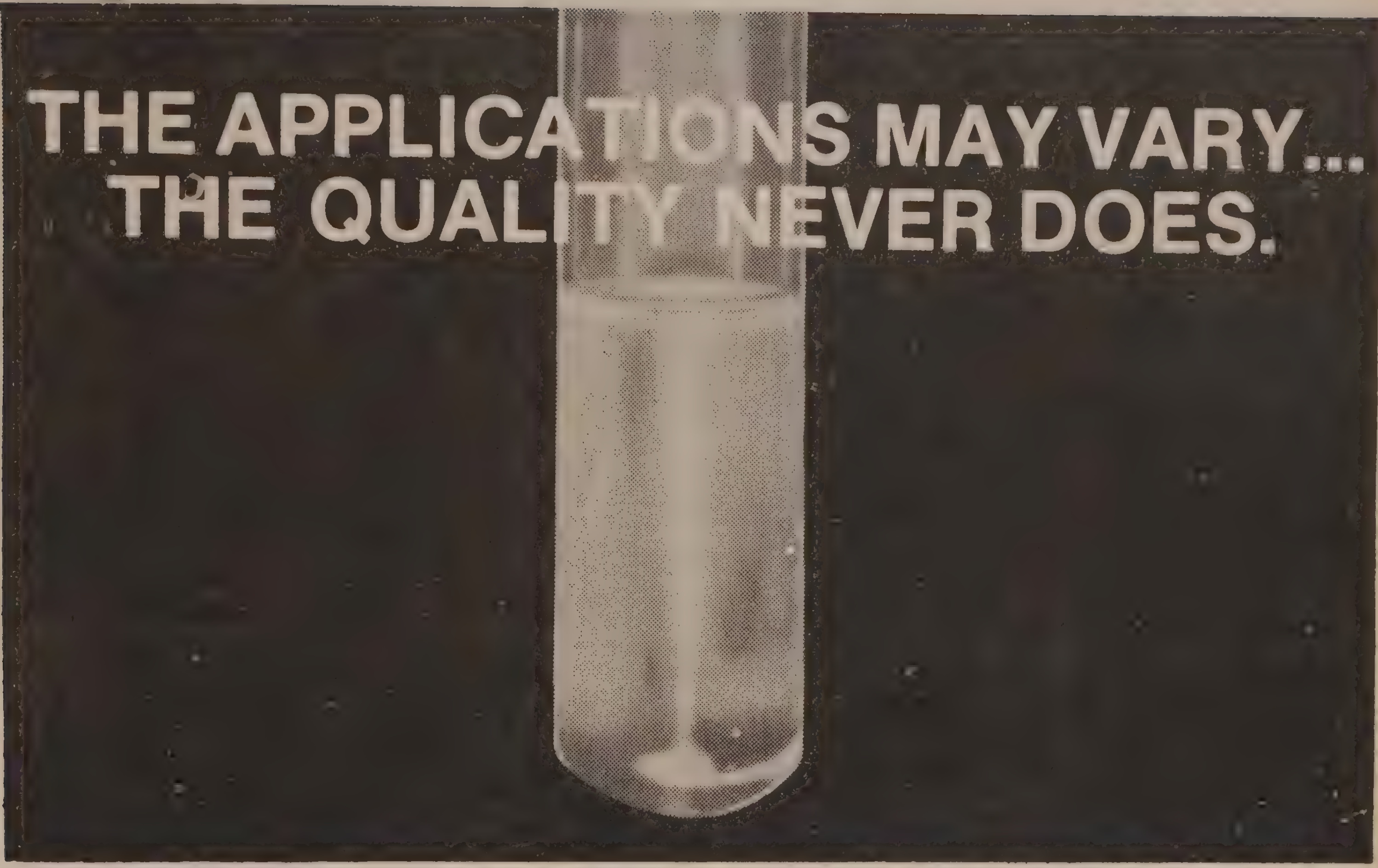

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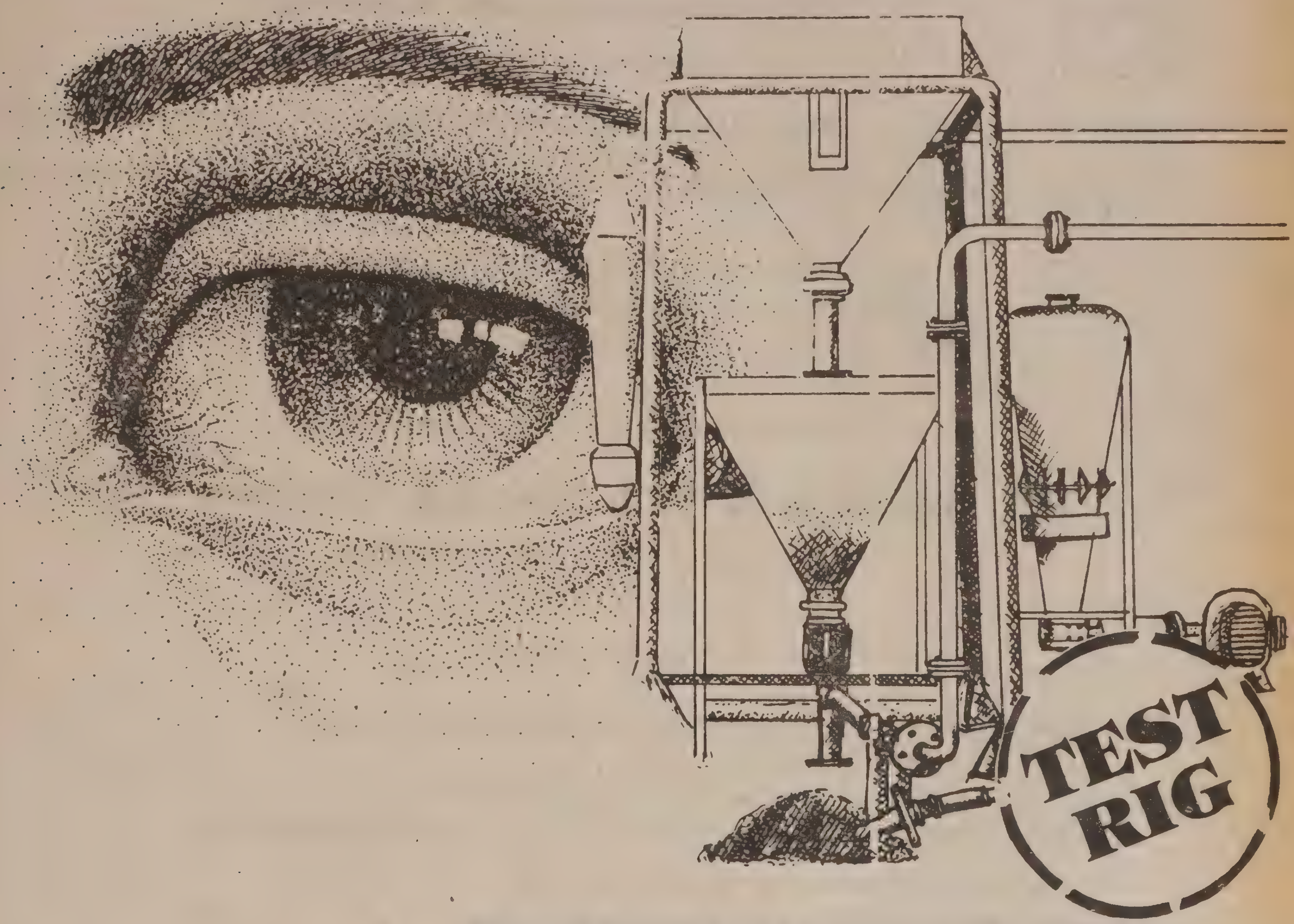

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HERALDING THE 21st CENTURY - 28 (b)

New Frontiers in Medical Research

Pain is a sensation that all can describe but few can define: Three types of pain are described (i) acute (post operative), (ii) chronic (arthritis) and (iii) intractable (cancer and nerve lesions). As a strategy for surviving in a hostile world, pain is a brilliant biological invention. Countless times every day, pain saves us from injury, warning us that a suitcase is too heavy to lift, that a hot plate is a bad place to rest a hand, that a twisted ankle needs a rest. But all too often, pain becomes "a burglar alarm nobody can shut off," says Dr. Mitchell Max of the Pain Research Facility at the U.S. National Institute of Health (NIH) in Bethesda, Maryland. Drugs that relieve pain can be classified into those that act on the periphery (peripheral) and those which act on the spinal cord or brain (central).

The total annual American health-care bill for pain approaches $40,000 million. Society's bill is even greater. A 1985 Harris Survey found that the average full-time American employee loses five workdays per year specifically because of pain problems. That represents a productivity loss of $55,000 million. "Many patients with chronic pain do not respond to medical care provided to them, and their suffering and disability remain and, with time, increase," Chronic-pain sufferers readily fall into a vicious circle, as excessive medication, loss of sleep, fear of physical activity and frustration and depression exacerbate the original pain. "Pain research wheel which remained conceptually stagnant for nearly a century, has now taken off. New discoveries about how chemicals in the body transmit and block pain are paving the way for a variety of new approaches to interrupting the body's perception of pain. There are two sets of pain signals, and the body has its own set of pain fighting chemicals that are despatched to various points when needed.

Another major break has come in the growing recognition that while chronic pain usually begins a medical problem, emotions and behaviour frequently reinforce it. Effective treatment requires helping patients to break out of their "pain behaviour" — the depression and fear of activity that can perpetuate chronic suffering. Such treatment programs have achieved dramatic results, especially in treating back pain. Scientists thought for decades that pain was like a message sent over a telegraph line: Nerve cells simply sent electrical impulses to the brain. But new research is uncovering a vastly more complicated picture, one involving dozens of biochemical and electrical processes that can operate both to heighten and to dull ur perception of painful stimuli.

The process starts at the point of injury. Say you burn your finger on the stove. The sudden heat stimulates two types of nerves —"slow" ones and "fast" ones. Both types respond by sending out electrical signals. It takes the fast impulse less than a sixth of a second to race the length of the nerve to the spinal cord. There the signal prompts a chemical called a neurotransmitter to squirt across a tiny gap to nearby spinal-cord nerve cells. These nerves carry the signal upto the brain stem and the higher brain, where you finally sense the pain. The "fast" signal is felt for only seconds, as sharp, localized and more disagreeable.

Back at your injured fingertip, other chemicals are exacerbating the situation. The burned tissue has released hormones called prostaglandins which attract blood. That is good, because blood contains white blood cells and substances that fight infection and promote healing. But the prostaglandins also sensitize the nerve fibers, meaning that less of a stimulus will fire them off. Pressing the burned area is going to hurt a lot more than pressing your other fingertips. At least two other classes of chemicals, bradykinins and leukotrienes, also flood the site of the injury. Like prostaglandins, they make the nerves more sensitive.

The pain pathway is not a one-way street. The brain and spinal cord have their way of cooling things off. Natural painkillers, including one called enkephalin, are sent down the spinal cord. Enkephalin stalls the release of substance P, a neurotransmitter in the spinal cord. With substance P neutralized, the pain message is jammed.

This new understanding also explains how some painkillers work. Aspirin, it seems, blocks the production of prostaglandins, which keeps swelling down and the nerves less exquisitely sensitive. Local anesthetics interfere with the electrical signal. Opiates, such as morphine, deactivate specialized chemicals in the nerves of the spinal cord and brain that receive the message. The discoveries also suggest new ways to intervene. Deep-brain stimulation, in which electrodes that carry a small electric current are implanted in the brain, has been used at several medical centres in the United States to block pain signals from reaching patients' brains and to stimulate the release of the brain's natural painkillers. The process carries some risk and is only used on people who desperately need it.

While blocking substance P may seem a good idea, it leaves animals not only pain-free but paralyzed. Researchers are still hopeful, however, that neurotransmitters involved in relaying pain can be zeroed in on and specifically blocked.

More immediately promising are substances that block the leukotrienes and bradykinins, the chemicals released in the area of an injury. Leukotriene inhibitors have performed well in animal trials and are going on to human testing. A group of Baltimore researchers recently reported that bradykinin-blocking drugs seemed to keep laboratory animals pain-free. Whether they can do the same for people remains to be seen.

Researchers have identified three predominant types of headaches — migraine, tension and cluster. Tension headaches are far and away the most common. When someone is under stress or is unusually depressed or tired, muscles in the head and neck tighten, producing a "hatband" of pain that many patients describe as a feeling that their heads are being squeezed in vise. Most tension headaches respond well to drug store standby remedies.

In the case of migraines, both the cause and the treatment remain much more elusive. Migraines appear to involve not tight muscles, but rather blood vessels in the head that swell up and irritate nerves.

Dealing with migraines seems to be mostly a matter of prevention. Once an attack is in full swing, usually little can be done short of the time-honored remedy of retreating to a dark room and bed for hours or even days until the throbbing subsides.

Cluster headaches are shorter-lived and affect only one or two percent of the U.S. population, nearly always men. But the pain, usually centered around one eye is so intense that some sufferers have been driven to suicide.

Doctors at the Montefiore Medical Center Headache Unit in New York prescribe calcium channel blockers. Calcium flowing into the muscular walls of blood vessels in the head can set off muscle spasms and cause the vessels to constrict, increasing pressure. The drug slows the calcium flow.

About ten years ago, specialists at South Shore Hospital in Miami Beach noticed that many patients who came in for back surgery had difficulty doing the prescribed reconditioning exercises following their operations. Neurosurgeon Hubert Rosomoff, decided to bring patients in two weeks before surgery, so they could better learn the reconditioning techniques and get back into shape faster after their operation. To the delight of the patients and the surprise of the medical team, the exercises worked so well that they made the surgery unnecessary. The doctors concluded that the pain came not from ruptured disks and bone spurs pressing on nerves, the usual reason for back operations but from muscles, tendons and ligaments surrounding the nerves.

For the 99 percent of sufferers who represent the vast majority of patients with back pain, diagnosis and treatment are less clear-cut. "We have a very poor understanding of who gets severe back pain and why, and our management of it leaves much to be desired is the opinion of a leading researcher.

For the millions who suffer from arthritis and other joint diseases, the knowledge that medical science can do little to cure underlying disease can make the pain especially difficult.

Cancer pain may be pain at its cruelest. It adds to the fear anguish that the disease evokes, and poses a final insult to the d The World Health Organization estimates that 3.5 million pe around the globe, including one million in the United States, su daily from cancer pain. About 25 percent of all cancer pati throughout the world die in severe pain, with no relief.

Yet the proper use of drugs could control the pain in more t 90 percent of these people. A landmark 1973 study at New Yo Montefiore Hospital found that doctors were overly cautious in scribing painkilling drugs for cancer patients, apparently beca of fear of addicting the patient and their own lack of knowle about proper dosages.

Nerves:

When the nerves themselves are affected by disease or inju the pain can be very bad news indeed. Take shingles, a skin eru tion that strikes some 300,000 Americans a year, mostly older p sons. The disease is caused by herpes zoster, the virus al responsible for chicken pox. The slightest touch to an affected ar triggers a scaring pain that lasts for hours or days. Only powerf drugs can take the edge off the torment.

Even after the disease clears up, a condition known as pos herpetic neuralgia often remains. Tender nerve endings in the ski have been so extensively damaged by the virus that the pain pe sists almost constantly for months or even years. Steroids help — sometimes.

Another nerve pain, known as trigeminal neuralgia, sends recur ring, stabbing bolts centered on the forehead, cheek and jaw area on one side of the face. This facial-nerve malady, commonly calle ticdouloureaux — French for painful spasm — is experienced mor frequently in middleaged or older persons, especially men. An attac often lasts less than minute, but the pain virtually paralyzes its victim Sometimes the onset is triggered by a jaw movement while eatin or engaging in conversation, washing the face or stepping out int a cold wind. Tic douloureux has been successfully brought unde control in most victims by carbamazepine, an anticonvulsant drug

Perhaps the most difficult-to-treat nerve pain is causalgia, a condition seen primarily among combat soldiers hit by rifle bullets. I a bullet "twanged" a nerve — passing near but not severing it — the result can be excruciating and virtually constant pain. If you are plagued by constant pain, few would blame you for looking pas the edge of established medicine for comfort. It's only natural tha you would wonder if such "alternative therapies" as hypnosis, acupuncture or massage might deliver you from pain's clutches. In fact pain specialists increasingly are finding that some of these relatively unconventional approaches can be useful as part of a comprehensive treatment program.

— T.P.S. RAJAN.

(Source: (1) Stephan Budiansky "Pain — What is science doing about it." — *SPAN*, January 1988; (2) Ray Hill and Kay Pittaway New Idea of pain Relief — *Chemistry in Britain*, August 1987.

CHEMARENA

S.L. VENKITESWARAN

Alaska Oil Spill

The extensive outflow of crude oil from the tanker Exxon Valdez off the Alaskan coast on 24th March this year -- as much as 11 million tonnes -- has cost the company Exxon an enormous sum which they estimate as $1.3 billion in their efforts to clean up the water and the coast line. Whether the efforts are adequate as claimed by Exxon or not, these efforts will not help to cleanse the tarnished name of the oil majors responsible for such repeated oil spills in the oceans of the world. Very systematic and elaborate plans to tackle such oil spillage including emergency measures have remained only on paper. The success of efforts at containment of the oil within limited areas or of mobilising microbes to digest the oil have been very limited.

Exxon took several days to start with "emergency" measures at containment or aerial spray of surfactants to emulsify the oil or to collect and pump out. But after the initial delay they claim to have mobilised 85 air craft, 1400 boats, 2000 hot water jets and other paraphennalia to clean up the badly affected coast line of 118 miles and restore it to near normalcy. But the oil spilt has remained in the sea and hardly a fourth was salvaged out. The bulk of the residual oil awaits storms, tides and time, perhaps months, before getting finally dispersed or eliminated.

The isolation of Alaska is a major factor in tackling the disaster and it is to Exxon's credit that in spite of high costs of labour and of supplies such as boats, they have managed a clean up. Whether there are additional costs such as compensation to the State or people whose livelihood was affected -- it is not known. In terms of life the casualities are reported to about thousand otters and 146 bald eagles -- the symbol of USA, plus thousands of fish buried in the bottom.

Poor otters which feed only on salmon had to be provided with their diet flown in at a cost of $ 40,000 for each. All this because of the Captain of Valdiz was said to have been drunk and dozed at the time of critical responsibility.

Nylon 66 -- to have or not

The proposal for the manufacture of nylon 66 industrial fibres (tyre cord) keeps returning in differing versions after every rejection. The reports are that the project may get clearance in spite of the vehement opposition. We can be rest assured that experts can always present acceptable presentations of the superior virtues of any product.

There are three fundamental questions which arise in the contexts of the country's economy. Is nylon 66 significantly superior to nylon 6 now being used for tyre cord in the country and even if some special grades of nylon 66 are required in small volumes, can such needs not be met by imports instead of creating a capacity for many times of that specific requirement (because a smaller capacity plant is not feasible). After all even Europe and Japan have perhaps only 5% of nylon 66 out of the total usage of polyamide fibre.

The second and related question is the competition angle of such large capacity (14,000 tonnes in this case) vis-a-vis India's present capacity for nylon 6 industrial fibres which is only of this order. The economy cannot afford more cases of sickness due to poor capacity utilisation and certainly the nylon 6 tyre cord industry must have a say in such a case.

The third and most important one is the foreign exchange on imports of intermediates for nylon 66. The programme even after the modifications envisages only the production of the prepolymerisation intermediate viz. A.H. salt and does not envisage the production of even one of the two organic chemicals required to make A.H. salt -- adipic acid or hexamethylene diamine. The import content is estimated at Rs. 40 crores for a turnover of 100 crores and this is to be covered by export of 42% of the production -- certainly no positive effort in export earnings. The plant is to be imported, presumably an idle one fully reconditioned and valued at $ 9 million. Presumably some concession may be provided on the heavy customs duty on A.H. salt. The argument that caprolactam is being imported for the present production of nylon 6 is not relevant because there is to be production in three new plants of 50,000 tonnes each and self sufficiency is expected within a year.

There has to be some basic guidelines on projects of this type with high import content and no backward integration besides conflict with established production of equivalent material to meet the bulk of the demand. In the case of nylon 66 there was a proposal to establish production to meet some special needs but this was not persisted with. Nylon 66 is claimed to be a better engineering plastic than nylon 6 but there are other materials too of equal importance.

A petroproject in Malaysia

Malaysia is taking up a petrochemical project of limited product range but of large enough capacity to ensure viability, and based on imported LPG -- propane and butanes. This also uses the latest technology and with overseas investments. The propane and butane mix is to be dehydrogenated to the olefines by the UOP process and the propylene and isobutylene are separated after this dehydrogenation step. The major products will be polypropylene with a capacity of 100,000 tonnes and MTBE with a capacity of 300,000 tonnes for which methanol 110,000 tonnes will be produced. The Unipol PP process is to be employed and Petromas (Malaysian Govt. Company) will have 55% equity, Idemi of Japan 35% and Neste OY of Finland 10% on this PP pr ject. For MTBE there is to be a separate company with 60 Petrobras, 30% Neste OY and 10% Idemitsu.

The projects are quite innovative and imaginative bas on the LPG which is widely traded petroleum product ar not complicated by the "complex" concept of multiple pr ducts and problems.

Products from maleic anhydride

Maleic anhydride is a medium level organic chemical produced and used in far less quantity than phthalic anhydride but for higher value products. Apart from the polyester resins the pesticide malathion is a major outlet but new high value products have been produced by emerging technology. Of these an Austrian process for conversion to glyoxalic acid is of special interest. Dimethyl maleate is the first stage from maleic anhydride and then a special process of ozonolysis results in glyoxalic acid after decarboxylation. Only carbon dioxide is the waste product and conversion is claimed at 80% of this ozonolysis reaction. The usual process is of oxidation of ethylene glycol with nitric acid with coproducts glyoxa The world market for glyoxalic acid is said to be 8,000-1,00 tonnes valued at $ 18 millions.

The second process of importance is one by Davy McGe for hydrogenation of the diethyl maleate into the valuabl 1,4-butylene glycol which is the preferred diol for polyesters (of PTA) of plastic grades and application. The speciality is a twostage hydrogenation to succinate under mild condition and subsequent hydrogenation to the alcohol with or without tetrahydrofuran as alternate product.

Methane to Diesel

The plentiful supply of natural gas, primarily methane, and shortage or shortfalls in liquid fuels for cars and trucks has been the thrust in process developments for converting methane into liquid fuels. The obvious and easiest way is to make methanol and use it directly as a fuel or in blends with petrol or diesel. This has not made any headway under present conditions of relatively easy oil supplies at fairly low prices. The earlier oil shocks have faded into the background. But even so for countries with balance of payment problems and dependence on imports for most or substantial part of its oil needs the conversion of gas to oil can be useful if there is indigenous availability. Newzealand set the trend with their methanol to gasoline plant based on "breakthrough technology". The methanol is derived from methane. But this MTG technology has also not caught on due to price factor.

The MTG process has been modified to vary the boiling range of the hydrocarbons produced up to the diesel fuels. Whatever the level of efficiency in conversion the basic fact is that the oxygen introduced making methanol has to be eliminated as water and the overall yields are reduced. The process can lead to aromatics (BTX) but the ratio of product on methane gets even worse. But considering the expected oil scenario of the early 21st century there is a place for methane to liquid fuels in the near future and for countries like India the emphasis is on the kerosene—diesel range.

In this context India's NCL Pune has developed the process knowhow for methane to kerosene/HSD. This is also via methanol and is the result of NCL's expertise in molecular sieve catalysts. The scale up of this process to a pilot plant is now to be taken up with Davy Power Gas for design/engineering the scale up. The pilot plant of an expected 3 ton per day output is expected to cost Rs. 6 crores and will be financed by BPCL at their refinery in Bombay. The outcome of the trials will be of enormous interest. While technology may not pose any problem the basic question is of costs. Methanol prices in India are high and an integrated large plant at the gas source could reduce the cost. Even at Rs.3 per kgs. of methanol the kerosene or diesel will cost about Rs. 7 per kgm. or Rs. 6 per litre for bare raw-material.

For a refinery with diversity of products, pricing for different products can be flexible if taxation does not come into play to distort the picture. Leave aside the excise duty exemption, some subsidy on such production may be inevitable. India is not alone in attempts to convert gas to diesel fuel. In Norway the Statoil (stateowned company) is going ahead with process development and possibly commercial production by 1996.

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UP restricts alcohol sale to other States

Uttar Pradesh, the largest producer of alcohol, has restricted movement of the commodity to neighbouring States.

The ostensible reason is that requirement of consumers within the State should get precedence over those in other States. The real reason, according to informed sources, is to maintain the price level at the prevailing Rs. 2.25 a litre.

UP is the only State where alcohol is selling at the BICP-fixed rate of Rs. 2.26 a litre. This is more due to the plentiful availability of the material rather than the Government's desire to comply with the Ethyl Alcohol (Price Control Order) enacted by the Union Government.

Leading distillers in the State are keen on selling in the neighbouring States following the failure of the All-India Distillers Association (AIDA) to export the material overseas. They now allege that the State Government, at the instance of some leading alcohol consuming units, is restricting sale outside UP with a view to keeping the price depressed.

In all other States, alcohol is being sold at higher price than the one fixed by the Government. The material is sold at Rs. 3.15 a litre in Maharashtra and Rs. 4.25 a litre in Gujarat. One consumer in Gujarat has filed a case in the State High Court seeking enforcement of the BICP-fixed price.

The Supreme Court is also hearing a case filed by Synthetics and Chemicals Ltd., questioning the right of State Government to levy taxes other than sales tax on alcohol. Industry observers say the Government is guilty of discrimination when it takes to task, drug units flouting the Drug Price Control Order (DPCO). The State Governments themselves are party to violating the alcohol price fixed by the Government.

The All India Alcohol-Based Industries Development Association has requested the Government to commission a perspective plan for chemical industry on non-petroleum resources, on the lines of the D.V. Kapur Committee on petrochemical industry. This is necessary because it has been proved that the ethanol-route is cheaper than petro-route for some chemicals which have export potential.

The Government has now removed the industry from the negative list, making it eligible for assistance from financial institutions.

Meanwhile, most industry observers are sceptical about the viability of SM Dyechem's project to produce ethylene oxide and glycol from alcohol in Maharashtra. This is because though the State Government has allocated alcohol for the project there is no similar assurance on the price, and price can dictate the success or failure of the project.

India Glycols, floated by the Vam Organic group of Bharatias, is successfully running an alcohol-based glycol project in UP. Unlike SM Dyechem, Vam Group has the advantage of captive distilleries, it is pointed out.

ENVIRONMENTAL CLEARANCE FOR PHOSPHORIC ACID STORAGE

Two companies in the private sector Deepak Fertilisers and Petrochemicals Corporation Ltd. and the Ansal group, have obtained the clearance from the Ministry of Environment and Forests for their respective projects.

The environmental approval accorded to Deepak Fertilisers recently pertains to the development of storage facilities for phosphoric acid at the Jawaharlal Nehru (Nhava Sheva) port which is required for the production of certain nutrients.

Deepak Fertilisers will have to take steps to prevent leakage of phosp acid from the pipeline and fro storage tanks.

To this end, the project author will have to take up surveillance o acid handling systems and ensure the length of the pipelines are ke the barest minimum.

While arrangements for water su on board and in the storage facil must be ensured for flushing out p phoric acid in the event of any leak appropriate protective clothing will h to be provided for the personnel ha ling the acid.

The authorities have been told to p pare a contingency plan to meet a emergency situation and raise a gre belt around the periphery of the stora tanks.

ACETIC ACID IMPORT SOUGH

The Small Scale Paracetamol Ma ufacturers Association has pleaded f import of acetic acid at a nominal du since there is an acute shortage of acet anhydride, an important drug interme iate for manufacture of basic drug dyestuffs, perfumeries and other chem icals.

The Association has said in a pres release while Drug Price Control Orde (DPCO) 1987 prohibits the manufactu ers from increasing prices of drug without prior approval of the Govern ment, there is no price control on th inputs. The drug industry has justifiabl pleaded with the Government to contr prices of intermediates by import o such products when indigenous price go up.

Acetic anhydride is made from aceti acid which is an alcohol based chem ical. There are about eleven units in th country with a licensed capacity t make 55,000 tonnes of acetic anhydride However, most of the production goe as captive consumption.

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Alcohol-based units allowed to tap FIs for funds

The Government has decided to remove alcohol-based industries from the negative list thereby allowing them to tap the financial institutions for assistance. The proposal was cleared recently by the Cabinet Committee on Economic Affairs (CCEA). A notification in this regard is expected to be issued soon.

According to official sources, the move follows the spurt in the licences given by the government for setting up units for making acetic acid through the alcohol route. Against an installed capacity of 1.2 lakh tonnes a year ago, the Government has now given licences for setting up an estimated three lakh tonne capacity for making acetic acid.

Alcohol-based industries were included in the negative list — under which low priority is given for assistance from financial institutions — in 1986 following approval by the CCEA. This was because during that period, there was a lot of uncertainty about the availability of the raw material with the country even having to resort to imports. Even otherwise, this sector was not really taken as a priority one.

The move to remove alcohol-based industries from the negative list also follows the improvement in the availability of alcohol in the country in the last two years, which in turn explains the spurt in approvals for setting up new units in allied areas. In addition, the applicant units approached the Department of Chemicals and Petrochemicals for assistance in tapping financial institutions as they were finding it difficult to raise the required resources. They pleaded that in view of the sea-change in the availability of the raw material, there was no reason for alcohol-based units to be in the negative list.

The issue was taken up by the Department which also took the matter to the committee of secretaries. The committee, however, noted that as the CCEA had placed the industry in the negative list, any proposal for change should also be taken up by the latter. After prolonged deliberations, the subject was finally sent to the CCEA with detailed background. The CCEA cleared the proposal recently, keeping in mind the changing availability scenario.

While the industry seems enthused over the development, as also the Government decision against permitting the public sector Gujarat Narmada Valley Fertiliser Corporation (GNFC) to produce acetic acid through the methanol route, it is worried on a totally different count. For, despite the surplus available for exporting alcohol now, it finds itself stumped. This is because the State Governments of Karnataka and Tamil Nadu are adamant on levying duties on the supply of alcohol for export. The two states want to impose duties on exports just as they impose local taxes.

The problem has arisen as Uttar Pradesh, a major supplier of alcohol has found it difficult to spare the identified 700 lakh litres for export purposes. Accordingly, the supply source was diverted to states like Maharashtra, Karnataka and Tamil Nadu. While exporters are not having any problems with Maharashtra, they are finding it difficult to get the material from Karnataka and Tamil Nadu. Both UP and Maharashtra do not levy any taxes for export.

The exporters argue that if they were to pay duties for picking up alcohol for export, it would be difficult for them to sell at viable prices. The Karnataka Government, for example, wants Rs. 8 per litre against the local price of Rs. 2.90. The industry finds the states' stand strange as both Tamil Nadu and Karnataka have been asking the Central Government for help in disposing off their surplus alcohol. At the same time, they are reluctant to give up the m to levy or reduce even the local ta

Meanwhile, the Government deci against allowing GNFC proposal foreign collaboration to make ac acid from methanol has prompted company to apply for setting up export-oriented unit at Bharuch for same. The application is now under co sideration.

IPCL'S BARODA PLANT GETS ENVIRONMENT CLEARANCE

The Indian Petrochemical Corpor tion Limited's (IPCL) butadiene extra tion revamping facility at Baroda ha been cleared by the environment minis try. The ministry has directed IPCL t strictly adhere to stipulations made b the state pollution control board, official sources said.

The project authorities have also been asked to submit a thorough environmental impact assessment report and detailed environmental management plan within six months to the ministry for review.

The report should highlight in detail the air quality, modelling, land use plan, analysis of polycycle aromatic hydrocarbons in respect to carcinogenecity (ability to cause cancer) and suspended particulate matter.

The Indian Petrochemicals Corporation Limited has been told that gaseous emissions from the various processing units should never exceed the prescribed limits and in the event of failure any pollution control system, the unit concerned should be put out from operation immediately and should not be restarted, until control systems are rectified.

The plant authorities, the ministry told the IPCL, must recycle the effluent waste water to the maximum extent possible either for their plant utilities or for afforestation.

RIL plans to raise Hazira plant capacity

Reliance Industries Limited would be raising the capacity of its gas cracker at Hazira to the minimum economic size of four lakh tonnes per annum. Disclosing this in Bombay on September 30, the company's Chairman, Mr. Dhirubhai Ambani, told shareholders at the annual general meeting that the letter of intent for setting up of gas cracker at Hazira has been received by the company and the plant would currently have capacity to produce 3.20 lakh tonnes of ethylene and its by products.

Mr. Ambani has also disclosed that the company would set up several down stream projects based on the feed stocks of the cracker. These projects — for the manufacture of petrochemicals, polymers, rubbers, etc. for a total of 10 lakh tonnes per annum — would involve an investment of about Rs. 2,000 crores.

The company has also received the Government's approval to set up a Rs. 750 crore 100% export oriented unit to produce 2.70 lakh tonnes of paraxylene and two lakh tonnes of PTA per annum. With this project, the company will be amongst the top ten corporations in the world in the fields of paraxylene and PTA. The company also proposes to set up an overseas subsidiary to accelerate the overall export effort. The company's exports are expected to reach around Rs. 100 crores during the current year, which may soar to Rs. 5,000 crores by 1992-93.

Referring to expansion programme under the MES scheme, he said the company's capacity at Patalganga will be expanded to two lakh tonnes from one lakh tonnes at present, LAB capacity to 80,000 tonnes from 60,000 and polyester staple fibre capacity to 60,000 tonnes from 45,000 tonnes. The expansion programme is estimated to involve an outlay of about Rs. 800 crores.

He assured the shareholders that Reliance Petrochemicals, a subsidiary of the company, would complete its projects as per schedule. Striking an optimistic note on the company's outlook for the current year and its future prospects, Mr. Ambani said that sales by the company for the first six months of the current year have exceeded Rs. 800 crores from Rs. 715 crores for the same period of the last year, with more than proportionate increase in profitability.

NEW PARTY MAY ACQUIRE MAJOR STAKE IN SUNDERBAN FERTILISERS

Mr. Hardev Singh of HSB Fertilisers located at Hosiarpur is to acquire the controlling interest in Sunderban Fertilisers being set up in north Bengal to produce single super phosphate. Mr. Singh has business interests in north-east also.

The Rs. 12-crore Sunderban Fertilisers will have a total equity size of about Rs. four crores, of which the promoters' contribution is estimated at Rs. 1.55 crores. Mr. Singh is to hold equity worth about Rs. one-crore in the company.

As early as 1986, the Union Government gave clearance for Sunderban Fertilisers Limited to be located at Lakshmikantapur in the backward Sunderban area of the no-industry South 24 Parganas district. However, the project did not get off the ground for a variety of reasons.

A section of local people, with support from outside launched an agitation apprehending massive environmental pollution, even Bhopal-type disaster, with the setting up of the project. The question of the acquisition of land, about 40 acres, got delayed, and capping it all, there were other complications, some having political overtones. The three years of uncertainty has hit the project hard.

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BID TO CUT DOWN PRICE

Paraxylene excise may go

The Union Government is actively considering withdrawal of excise duty on paraxylene to bring down the raw material cost for the consuming industry as per the recommendations of the Bureau of Industrial Costs and Prices (BICP).

The move appears to be to encourage the domestic production of paraxylene as an import substitute and stop its imports soon for saving foreign exchange worth Rs. 60 crores per annum.

Paraxylene is a basic raw material for the production of DMT and PTA. Among the DMT/PTA producers, IPCL, Reliance Industries and Bongaigon Refineries (BRPL) have their own production of paraxylene for captive consumption, while Bombay Dyeing solely depends on imports for its requirement. IPCL and BRPL were also importing marginal quantity to meet the shortfall in supply.

The entire scenario is expected to undergo a sea-change with the debottlenecking of IPCL paraxylene units some time next month, which may enable it to offer 17,000-18,000 tonnes of surplus.

IPCL is also the canalising agency for the import of paraxylene, for which the Government releases foreign exchange from time to time to bridge the gap between demand and indigenous production.

So far the annual import was estimated around 48,500 tonnes comprising 42,000 tonnes by Bombay Dyeing, 4,000 tonnes by IPCL and 2,500 tonnes by BRPL.

The Government had reduced the import duty on paraxylene from 120% to 90% in the Union Budget of 1989-90 to bring down the raw material cost and now the Government is considering to withdraw the 15.75% excise duty. The only beneficiary of such a step appears to be Bombay Dyeing as excise is not applicable to other DMT/PTA producers for captive consumption.

The Government is planning to remove excise duty on paraxylene as no revenue loss is involved. It was just a notional duty since there was marketable surplus for open market sales attracting the duty.

Along with the expected marketable surplus of around 18,000 tonnes of paraxylene from IPCL, Reliance Industries is also understood to have informed IPCL, the canalising agency, and the government officials about its ability to offer 30,000 to 40,000 tonnes of paraxylene per annum after meeting its captive consumption. It had already offered IPCL 2,500 tonnes each for August and September 1989.

With 18,000 tonnes of indigenous supply for IPCL and an additional 30,000 to 40,000 tonnes from RIL, the import may virtually come to a halt soon.

The only hitch appears to be that there is no excise duty on imported paraxylene, while the sale of surplus indigenous material is subject to duty, which may increase the cost of raw material for Bombay Dyeing by Rs. 3,000 to Rs. 4,000 per tonne.

The Government, it appears, feels that the withdrawal of excise could save huge foreign exchange besides boosting indigenous production capacity utilisation. Further, it could also ensure uninterrupted supply of paraxylene to the consuming industry.

It might be recalled that at the annual meeting of Bombay Dyeing towards August-end 1989, its Chairman Mr. Nusli Wadia had stated that can isation of imports through IPCL h resulted in a host of problems for t company in obtaining regular and a quate supply of paraxylene.

Since canalisation was introduce the company had to be without para ylene twice, having had to borrow it a suspend DMT production for sever days, he added.

Another point the authorities fe favourable in boosting domestic produc tion and consumption of paraxylene surplus naphtha which is currentl exported at very low prices in the inter national market, could be effectivel used to produce value added paraxylene

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CANADIAN AID FOR ONGC

The Export Development Corporation (EDC) of Canada has announced that it will provide finance to the tune of $ 377,276 to support a sale of fireflood ignition equipment and services by Petro-Therm Enterprises Ltd. to the Oil and Natural Gas Commission (ONGC).

The Calgary based Petro-Therm Enterprises would supply a specialised equipment package and services which would be used for the enhancement of oil recovery in the Balol and Lanwa oil fields in India, according to a press release issued by the EDC at Bombay on September 30.

A fireflood consists of injecting air into a well in order to provoke combustion within the reservoir, which facilitates the pumping of oil at the surface.

The Canadian International Development Agency (CIDA) would also provide a parallel financing of $ 231,233 for the transaction. Both the amounts represent an allocation made under the oil and gas financing facility established jointly by EDC and CIDA to provide financing to Indian buyers from the oil and gas sectors.

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JOINT SECTOR REFINERY PROJECTS

UB, RIL, Essar in race

The UB, Reliance and Essar groups have made proposals for participation in the new joint sector petroleum refineries to be set up in Eastern and Central India by the Indian Oil Corporation (IOC) and the Bharat Petroleum Corporation Ltd. (BPCL), respectively.

While the UB and Reliance groups are vying for the Eastern India refinery to be set up at Daitari in Orissa, Essar is making a bid for the BPCL refinery for which a final site selection is yet to be made. The refinery is likely to be located in Madhya Pradesh.

The two new refinery projects, each with a capacity of processing six million tonnes of crude oil, were thrown open to private sector participation by the Petroleum and Natural gas Ministry recently. The announcement about exploring the possibility of private sector participation in the Eastern India refinery was made on September 23 and that of Central India refinery on September 25.

The proposals from the three private sector groups are now being processed by IOC and BPCL. The Petroleum and Natural Gas Ministry is likely to wait for a few days more to allow other companies to make their efforts before making its recommendations to the Government for a decision on the private sector partners for IOC and BPCL refineries.

The Petroleum and Natural Gas Ministry has made it clear that the private parties have to be found suitable from both financial and technical angles. They should also make suitable arrangements to meet the foreign exchange and rupee cost of the projects without recourse to significant dependence on the domestic financial institutions.

The Daitari refinery and the associated crude oil pipeline is estimated to cost about Rs. 1,600 crores. The Central India refinery project is estimated to cost Rs. 1,900 crores, excluding the cost of a single point mooring terminal with support facilities at Vadavan point in Maharashtra and laying of crude oil pipeline from Vadavan point to a location in Central India.

It has also been made clear, that in case of the Daitari refinery, the petroleum products refined by the joint venture company will be sold to the IOC. The Corporation will make its own investment in the rail loading multiproducts gantries and storage tank, etc. It will also lay a product pipeline from Daitari to Allahabad for transporting motor spirit, kerosene and diesel.

The Daitari refinery of IOC will be based on imported crude oil and will meet the increasing demand for petroleum products in the Eastern region. According to the feasibility report submitted by the IOC to the Petroleum and Natural Gas Ministry, the refinery will cost Rs. 1,466.50 crores at 1989 prices, and will include a foreign exchange component of Rs. 222.10 crores.

The associated crude oil pipeline will be 100 kms long and will pump the crude received at the Paradeep port to Daitari. The pipeline will have cathodic protection, telecommunication and tele-supervisory controls. The total cost of these facilities will be Rs. 145.29 crores, with a foreign exchange component of Rs. 32.26 crores.

The petroleum products pipeline to be laid by IOC on its own will carry products from Daitari to Allahabad over a distance of 828 kms traversing Orissa, Bihar and Uttar Pradesh. It will have four intermediate pump stations at Kendujhgarh, Rourkela, Ranchi and Chandani, with terminal facilities at Allahabad. IOC also proposes to provide tap-off points at Rourkela, Ranchi and Allahabad. The pipeline, wit capacity of three million tonnes, is e mated to cost Rs. 416.58 crores, wit foreign exchange component of 63.80 crores. The Daitari refinery is be completed within 48 months approval of the detailed feasibil report for the project by the Govt.

For its Central India refinery, BPC has also prepared the feasibility rep and suggested three sites includin Hoshangabad. Some advance action h been taken in identifying the coast location for putting up the terminal f receiving crude oil. The refinery is produce the normal range of petroleu products to meet the requirements i Central India and to make up for thei overall deficit in the country.

The selection of the process units by BPCL has been done keeping in view the need to maximise production of middle distillates, like kerosene and high speed diesel oil. The process units selected include those for crude distillation, vacuum distillation, product treating, sulphur recovery, fluid catalystic cracking, catalystic reforming, solvent extraction, dewaxing, hydrofinishing, deasphalting and bitumen growing. A provision has also been made for a captive power plant in the refinery to meet the power and steam requirements.

Preliminary discussions have also been held by BPCL with various process licensors for the selection of an appropriate technology for incorporation in the refinery. BPCL has also held detailed discussions with Madhya Pradesh Government officials for their assistance in acquiring 2,500 acres of land. The petroleum ministry is also likely to take a decision soon on the continuation of the Tatas in Karnal refinery. The Karnal refinery was thrown open to the joint sector a few years back and a memorandum of understanding was signed between IOC and the Tatas for this refinery. The progress of the refinery project has been extremely slow.

NAPHTHA CRACKER AT VIZAG

UB Petrochem gets clearance

The Government has decided to grant a letter of intent to United Breweries Petrochemicals Ltd. for setting up a naphtha cracker unit at Vishakapatnam at an estimated investment of Rs. 1,000 crores. The unit will have a capacity for producing 300,000 tonnes of ethylene. The company's application for a letter of intent was approved by the Cabinet Committee on Economic Affairs (CCEA) at a meeting in New Delhi on October 4, an official spokesman said.

Of the estimated investment, the foreign exchange component is Rs. 200 crores which would be financed by supplier credits, loans and bonds. CCEA has also approved an application from Essar Investments for setting up a 40-lakh tonne iron ore pellet unit in Vishakapatnam at an estimated investment of Rs. 340 crores. The Committee has also approved an application from Gujarat Alkalies and Chemicals, Baroda, for setting up an industrial unit for the manufacture of float glass at a cost of Rs. 210 crores in a suitable backward area in Gujarat. The unit will have a capacity of 25 million square metres of float glass.

CRL-BALMER LAWRIE TIE UP TO MAKE NEW PRODUCTS

The Cochin Refineries Limited (CRL) proposes to set up a new joint venture company in the country in association with Balmer Lawrie to take up manufacture of certain new items. These items include polybutene, polyisobutylene and maleic anhydride. The proposal to set up the joint venture company, which is part of the CRL's expansion plan, is now under consideration of the Petroleum and Natural Gas Ministry.

The Cochin Refineries also proposes to take up manufacture of 75,000 tonnes per annum of normal paraffin. Another proposal is to take up production of benzene and xylene as part of the second phase of the aromatics complex. CRL has already completed a project for production of 87,200 tonnes per annum of benzene, which is expected to fully meet the requirements of Hindustan Organic Chemicals Ltd., and FACT. It has also set up facilities for production of 12,000 tonnes per annum of toluene recently.

The proposals for expansion of the refinery capacity of CRL from 4.5 million tonnes per annum to 6.5 million tonnes per annum is also under consideration of the government. This expansion is to be undertaken by debottlenecking and installation of a separate LPG recovery facility. A captive power plant is being set up by CRL at an estimated cost of Rs. 57 crores. It is expected to go on stream by April 1991.

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HOC to invest Rs. 350 crore in various projects

The State-owned Hindustan Organic Chemicals (HOC) under the Department of Chemicals and Petrochemicals has drawn up plans for an investment of about Rs. 350 crores in various projects.

The company is setting up a new nitro aromatics complex at Rasayani with a capital investment of Rs. 180 crores. The proposal for a caustic soda/chlorine plant of 33,000 tonnes annual capacity at a cost of Rs. 45 crores is under the Centre's consideration. It has already completed its Rs. 100-crore unit at Cochin and a Rs. 45-crore project in the joint sector at Medak in Andhra Pradesh.

Disclosing this at the annual general meeting of the company at New Delhi, on September 30, the Chairman, Mr. H. Krishnamurthy, said HOC has been able to double its export of chemicals to many developed countries. Exports during 1988-89 touched Rs. 12.66 crores compared to Rs. 6.48 crores in the previous year. Profits have also doubled from Rs. 10 crores to Rs. 20 crores.

HOC, he said, is the first Indian company that has exported phenol and acetone, which are used in the manufacture of medicines, dyes and dyestuff. Its customers include Mitsui in Japan, RMC in Singapore, Macma Ltd. in Indonesia, Malaysia, South Korea and many other European countries. Besides, HOC is also exporting various other items which have wide applications in antitubercular drugs, pesticides and photo films.

The company has declared a dividend of over Rs. 2.5 crores for the year against Rs. 1.7 crores in 1987-88. It has been declaring dividends for the la years. Overall production during year rose to 1,19,123 tonnes aga 1,57,743 tonnes in the previous — an increase on 21 per cent. Proc tion also exceeded rated capacitie respect of a number of plants suc dinitrobenzene (125%), acetani (171%), formaldehyde (132%), ni chlorobenzene (116%) and chlorob zene (104%).

The capacity utilisation at the Ra yani unit was 99.6% against 98% in t previous year. The manufacture phenol and acetone at Cochin was al satisfactory.

The sales turnover during 1988-8 also went up to Rs. 176.58 crores compared to Rs. 127.45 crores in the previous year, an increase of about 39% Higher sales, Mr. Krishnamurthy saic was achieved by offering attractiv terms to the customers and bette product-mix.

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CCS for caustic soda extended up to 1992

The five per cent cash compensatory upport on exports of caustic soda hich was restricted to a period of six nonths, has now been extended up to 992. The incentive which was hitherto onfined to exports of flakes, has also een widened to include fused solid ariety.

The chlor-alkali industry had sought xtension of CCS to include caustic oda lye and fused solid forms, and also nhancement of the rate to 12% of f.o.b. alue as recommended by the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council Chemexcil).

The industry made a debut on the xport front in early 1988 when caustic oda in the international market firmed p. It exported about 16,000 tonnes uring 1988-89 mostly to south-east sia. The major exporters have been ased in the South.There had been comlaints of pressure on costs of its two asic raw materials: power and salt. requent power cuts have forced some nits to go in for captive power genering sets to supplement their requireents. This trend will add to the dustry's cost of power. Efforts in the eld of energy conservation have been utralised by frequent upward revision tariffs, fuel surcharge and other ties, according to the Alkali Manufacrers Association of India.

The availability and steep rise in the ice of salt is also causing anxiety. As figures published by the Office of Salt Commissioner, salt stocks have clined sharply from 77 lakh tonnes in cember 1987 to 51 lakh tonnes in cember; 1988. It is quite likely that dequate availability of salt may prove e major problem for the alkali induswhich has been expanding owing to round increase in demand.

According to the industry, the probn can be solved to some extent by ly allowing captive production of industrial grade salt by alkali units. It also favours lifting of the current ban on some of the captive producers from selling their surplus stock.

The caustic soda price front has been equally chaotic, with producers taking advantage of shortages and booming demand to charge prices higher than warranted by input costs, according to the consuming industry.

Caustic soda production touched 4.4 lakh tonnes during January-June, as against 4.02 lakh tonnes during the corresponding period last year. As on June 1989, the Government has sanctioned an additional capacity of 3.45 lakh tonnes. These include expansion allowed to three existing units, namely Chemfab Alkalies, Shriram Vinyl and Gujarat Alkalies and Chemicals Ltd. New units, among others, permitted to put up chlor-alkali units are Reliance Industries Ltd., Hindustan Organic Chemicals, Delta Paper Mills and Varinder Agrochemicals, the Karnataka State Industrial Development Corporation, Haryana Alkalies and Chemicals and Indian Aluminium Co. Ltd.

NIRMA KEEN TO SET UP SODA ASH UNIT IN AP

Nirma Industries has shown keen interest in setting up a soda ash manufacturing unit at Masulipatnam, the AP Chief Minister, Mr. N.T. Rama Rao said at Hyderabad on October 3.

Stating that the recently announced incentives has already evoked good response from the industry, Mr. Rama Rao said that Nirma is also putting up a LAB project at Visakhapatnam for which it has obtained a letter of intent for the Centre.

APIDC has been holding a letter of intent for soda ash manufacture since long.

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Petrochemicals — big TN thrust proposed

It has been proposed that Tamil Nadu should make a massive investment to the tune of Rs. 6,300 crores over the next ten years in "core petrochemical industries" to gain a footing in the field.

At present, the State's share in the country's installed capacity for production of petrochemicals is a meagre 5.9 per cent. The major items produced in the State are polyvinyl chloride, PFY, PSF, nylon tyre cord and LAB.

According to an official paper, the investment outlay can be spread over two phases, one covering the Eighth Plan with Rs. 3,000 crores and the other during the Ninth Plan period with Rs. 3,300 crores.

It is estimated that Tamil Nadu can easily contribute 15-20 per cent of the total demand for three major divisions of the industry, namely, polymers, fibres and chemicals, as projected by the Kapoor Committee for the period till the turn of the century.

The field is now dominated by Maharashtra and Gujarat by virtue of their easier accessibility to the feedstocks like oil, gas and naphtha. More recently, Uttar Pradesh has also entered the scene by bagging the Saleempur aromatic complex and Auriya gas cracker project.

The first phase envisages setting up of 'mother units' for production of building blocks (aromtics and olefins) and bulk petrochemicals. Fortunately, an aromatic complex in the joint sector has already been cleared for the State. It is forcefully argued that the project should come up fast so that it goes on stream by 1995.

Simultaneously, an exclusive port terminal with a separate jetty should be created for handling building blocks and intermediate chemicals. This will require developing a separate approach waterway and a harbour and adequate storage facilities within the framework of safety and environmental standards. It has also been suggested that plants for production of a host of bulk petrochemicals too be set up in the first phase itself, taking cognisance of the minimum economic size recently laid down by the Union Government.

It is pointed out that the Union Department of Chemicals and Petrochemicals has targetted an allocation of Rs. 15,000 crores for the Eighth Plan. It should not be difficult for Tamil Nadu to get a pro-rata share of 20 per cent in the outlay.

In the second phase covering 1995-2000, another mother unit for olefins is sought to be implemented. Besides, an integrated refinery based on either oil available in the Cauvery basin or imported oil should be set up solely to provide feedstocks for the petrochemicals industry.

These apart, a naphtha-cum-gas cracker and a propane dehydrogenation unit are to be established. There is also scope to promote additional bulk petrochemical plants based on the outputs of the naphtha cracker and dehydrogenation facilities.

The proposed massive investment will lead to the sprouting of a large number of downstream units in the small and medium sectors for conversion of bulk petrochemicals into consumer products. It is estimated that two to three lakh additional jobs will be generated in the process.

CCS FOR MORE PLASTIC ITEMS LIKELY

The Government is considering grant of cash assistance on exports of PVC cloth and sheeting, spectacle frames, fountain and ballpoint pens and goods fabricated out of fibre-reinforced plastics. The Plastics and Linoleums Export Promotion Council (PLEXCONCIL) has submitted the relevant cost dat the Commerce Ministry.

The Council has also urged the G ernment to expedite issue of the n fication exempting payment of exc duty on supplies of plastic raw ma ials by indigenous producers at in national prices against surrender advance licence.

PLEXCONCIL's exports touched all-time record of Rs. 129 crores duri 1988-89, which is twice the last year figure of Rs. 64 crores. Major thru items like plastic woven sacks, polyest films, jute based PVC floor covering plastic moulded and extruded good ropes, twines and laminates have be tered their export performance over th previous year.

For the current year, the Council ha undertaken an export target of Rs. 18 crores. The performance during April July 1989 had shown a 50 per cen growth over the corresponding period in the previous year.

The Council, in collaboration with Indian Petrochemicals Corporation Ltd has selected items like multilayer films, pipes and fittings, engineering plastics, mooring ropes and the like which can supplement conventional products to achieve a Rs. 400-crore target during the Eighth Plan.

Mr. Arvind Mafatlal, who handed over awards for top exporters in each product category at Bombay on September 29, observed that if India is to play a significant role in the global trade, it must overcome some inherent drawbacks. One was quality, referring to the goods and services.

Technical upgradation is also imperative to bring the industry on par with other competitors in the international market. There are unexplored markets in components made from engineering plastics, moulded goods for the automobile industry, blends, alloys and the like.

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Plastic processing zone to go on stream in 1990

India's first plastic processing zone at Sarigam in Gujarat is expected to start production by early next year. The exclusive plastic zone, proposed last year, could not take off earlier due to lack of infrastructural facilities like approach roads, water and power connections.

Substantial progress has now been made in providing these facilities, according to Mr. Vijay Merchant, president of All-India Plastics Manufacturers Association (AIPMA). He was addressing the association's 43rd annual general meeting at Bombay.

With seven lakh tonnes consumption of virgin polymers, the industry is contributing Rs. 1,200 crores revenue to the exchequer. With the projected consumption of 17 lakh tonnes in 1994-95, the revenue from the industry would increase to almost Rs. 2,500 crores, Mr. Merchant pointed out.

Apart from the increased revenue to the exchequer, the increase in tonnage will help generate income and employment. It is therefore imperative that the Government evolve a long-term policy on price and availability of raw materials for the processing industry. Stable price will ensure growth of the processing industry. In this connection, he referred to a Planning Commission study which established that demand for plastic was price elastic and use of reprocessed resins is inversely related to price.

It also pointed out that expansion of capacity of petrochemical units will be viable only if attempts are made to bring about cost reduction in production of polymers and these are actually passed on to the consumers. The new MGCC plant of Indian Petrochemicals Corporation at Nagothane, for example, will be 40 to 50% more energy efficient than other units in India, thereby helping cost reduction.

Mr. Merchant said the "selective finance policy" adopted by the financial institutions with regard to providing finance for the plastic sector has been inhibiting the growth of the industry. Unless the processing sector is able to create new capacities soon enough, new petrochemical complexes might become surplus.

He hoped that the Govt. did not raise the import duties in the wake of a fall in international polymer prices. The per capita consumption of plastics in India is amongst the lowest in the world.

COPPER, LEAD PRICES HI

Prices of copper and lead, sold b
Minerals and Metals Trading Cor
tion (MMTC), have been raise
Rs. 1,000 per tonne, while those o
and nickel have been reduced
Rs. 10,000 and Rs. 7,000 per to
respectively. There is no change in
price of zinc. The new prices, fixe
the interministerial committee of
Government, took effect from Octo
1, 1989 and will continue to remai
force till further notice. According to
MMTC press note, the copper and l
prices have been raised due to rise
international prices. Similarly the pri
of tin and nickel have been reduced d
to fall in international prices.

The new prices per tonne with o
ones in brackets are: Rs. 84,0
(Rs. 83,000) for electrolytic copper wi
bars, Rs. 80,955 (Rs. 79,955) fo
copper cathodes, Rs. 90,500 for contin
uous cast copper wire rods, Rs. 51,00
(Rs. 51,000 for electrolytic high grad
zinc, Rs. 51,200 (Rs. 51,200) for spe
cial high grade zinc, Rs. 29,50
(Rs. 28,500) for pig lead 99.97%
Rs. 29,700 (Rs. 28,500) for pig lea
99.99%, Rs. 340,000 (Rs. 350,000) fo
tin, Rs. 3,90,000 (Rs. 3,97,000) fo
nickel briquettes/squares/pellets an
Rs. 3,92,000 (Rs. 3,99,000) for nicke
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New proposals soon on fertiliser pricing

A new set of proposals on fertiliser icing will soon engage the attention the Government. The proposals were nong the last acts of Mr. R. Prabhu, inister of State for Fertilisers, before e was divested of his powers. These oposals will be considered by the ommittee of secretaries.

One of the proposals concern the ayment of subsidy to the manufactur- s, it says that the plant operating above 0% capacity should not be paid any bsidy for the production above 100%. he presumption behind the proposal is at these plants had been made more tractive by the promotors by building more capacity than the one declared.

This is strongly contested by the dustry which says that several factors into the capacity utilisation of ferti- ser plants. The plants are built on 330 ream days in a year and 35 days are pt for annual turnaround. Any effi- ent management reducing the 35 days' rnaround period can operate above 0% capacity.

The example of the old plant of Shri- m Fertilisers, which was commis- oned in 1969 when the retention cing system was not in operation and ere was no question of subsidy, is ing cited in this regard. This plant has o operated above 100% many a time.

Industry sources say that the Government should not grudge the plants operating above 100% since it does not pay anything for the better maintenance of the plants which enables them to operate at higher levels of efficiency. This is the negation of the pricing system which is meant to encourage efficiency and not to discourage it.

The sources also contend that the proposal will dampen investment in the fertiliser industry. The only way the investor hopes to have good return on his investment is through better capacity utilisation of the plant. But if any restriction is put on this score, the industry will further lose the investment charm.

The second proposal concerns the capacity utilisation norms for naphtha and fuel oil-based fertiliser plants. According to the revised norms, the plants which came up after April 1, 1982, will get 12% return at 80% capacity utilisation in the first year, 85% from second to tenth year, and 80% from eleventh year onwards. There was a move to make it uniformly 80% for all the years. But the fertiliser department has opposed it. It is apparently of the view that changing the norm would not benefit the public sector plants at Bhatinda, Panipat, Nangal expansion and Sindri modernisation which have completed 10 years of operation. This will help only the Gujarat Narmada Fertiliser Corporation (GNFC).

The department is understood to have recommended that the depreciation period, which was increased from 10 to 20 years, be now lowered to 15 years. But this has failed to satisfy the industry which says that it being a continuous process chemical industry involving corrosion, frequent replacement of equipment and modernisation, the depreciation period should not exceed 10 years.

EXPORTS MAY GO UP BY 40%

The Union Commerce Minister Mr. Dinesh Singh, has said that India's exports during the current financial year is likely to register a 40% increase compared to the 29% last year and 25% during 1987-88. Exporters had been provided with many facilities to step up exports. What was needed was upgradation of quality, he added at a seminar on export promotion in Lucknow recently. The seminar which was based on the report prepared by the Trade Development Authority and the IIFT of the Union Commerce Ministry considered four areas with export potential in UP. These were electronic and engineering industries, handloom and ceramics, footwear and sports goods and agricultural products and fruits.

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HDPE sack units to boycott PIL

The Orissa HDPE Woven Sacks Manufacturers' Association has decided to boycott Polyolefins Industries Ltd (PIL), a leading supplier of plastic granules, unless the latter comes out with a viable scheme by October 15, 1989 ensuring regular and adequate supplies of the raw material on reasonable rates to the local industry.

The industry has been repeatedly complaining to the State and Central Governments for the past few years over woefully inadequate supplies of raw material but without any result, industry sources said.

They point out that PIL, which has been allotted a depot at concessional rates in Bhubaneswar by the Orissa Industrial Infrastructure Development Corporation to enable it to take care of the needs of the State's plastics units, has supplied hardly seven per cent of the total requirement of HDPE granules in the state. The Orissa Small Industries Corporation (OSIC) which procures raw material for small units has been helpless in the matter of getting HDPE granules, the sources said.

The woven sack units in Orissa, which are rather new compared to units in other states which entered the market in boom years, are run mostly by first generation entrepreneurs. The units' problems were compounded by the mandatory order on jute packaging. The industry in Orissa, however, is stated to be having a better order position in recent months thanks to the interest shown by Paradeep Phosphates Ltd. which came to their rescue at the height of the crisis. However, the manufacturers have not been able to take advantage of the prospects of a revival because of the persisting shortage of granules.

The Association has accused PIL of making irregular offers, that too of imported material, in disregard of financial limitations of the entreprene in arranging foreign letters of credit. company should have diverted its in genous production to units in states l Orissa in adequate quantity on a r ular basis, and sent imported materi to large and bulk buyers who co absorb the costs involved, the Assoc tion has said. Even in regard to impor granules, the industry is said to ha received more competitive offers fro agents for high quality supplies fro Hong Kong or Singapore, which wou relieve them from problems of intern tional currency fluctuations.

The association has decided that case PIL does not meet its demands, would invite Reliance Petrochemical Maharashtra Petrochemicals or oth parties to set up a depot in Orissa, an seek the intervention of the state Government in the matter. It has secured th support of the Orissa Assembly of Sma and Medium Enterprises and the Oriss Young Entrepreneurs Association in th matter.

IPICOL TO SET UP FOUR SUGAR UNITS IN ORISSA

The board of directors of the Industrial Promotion and Investment Corporation Ltd. (IPICOL), at a recen meeting, approved the implementatio of four sugar factories in the state. Th Board also approved the joint secto agreement signed by IPICOL with th Modi group for the establishment of one-lakh tonne capacity caprolacta project at a cost of Rs. 600 crores. Th caprolactam project for which IPICOL had recently obtained a letter of intent will be set up in technical collaboratio with Ube Industries of Japan. The mai raw material, ammonia, is proposed t be obtained from the fertiliser unit of th Rourkela Steel Plant. SAIL may als participate in the equity of the project Caprolactam is a vital industrial intermediate which is used to manufactur nylon-6 for tyre cord and industrial fabrics.

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49TH AGM OF ICMA

Chemical industry urged to have energy audit

The Union Minister of State for Chemicals and Petrochemicals Mr. P. Namgyal had urged the Indian chemical manufacturers to pay high priority to energy audit and set targets for saving in the consumption rates of energy over a short period of time. He was addressing the members of the Indian Chemical Manufacturers Association at its 49th annual general meeting as the chief guest at Bombay on 27th Sep. 89. The Minister also urged the chemical manufacturers to enter into speciality chemicals manufacture in a big way and be competitive on the international market.

Earlier the outgoing ICMA President, Mr. S.M Datta welcomed the minister and Dr R.A. Mashelkar, Director, National Chemical Laboratory who delivered the Rajmitra B.D. Amin Memorial lecture on "Cornerstones of Tomorrow's Chemical Industry: Innovation, Performance and Knowledge Engineering". Mr. Atmaram Sarogi, the incoming President of ICMA proposed a hearty vote of thanks.

In the following pages are published the various speaches.

Presidential address by Shri S.M. Datta

Introduction

'It is my pleasure and proud privilege to welcome you to the Forty-ninth Annual General Meeting of the Indian Chemical Manufacturers Association. We are indeed very fortunate to have with us today Shri P. Namgyal, Minister of State for Chemicals and Petrochemicals, who has very kindly agreed to grace the occasion as the Chief Guest. On behalf of the Association, I would like to express our sincere gratitude to him for interrupting his busy schedule to be with us this evening. I would also like to extend a special welcome to Dr. R.A. Mashelkar, who has recently taken charge as the Director of the National Chemical Laboratory at Pune. We in the ICMA have enjoyed a special relationship with the NCL and we are indeed grateful to Dr. Mashelkar for his kind gesture in accepting our invitation to deliver the Rajmitra B.D. Amin Memorial Lecture. The subject matter of his lecture will be "Cornerstones of Tomorrow's Chemical Industry: Innovation, Performance and Knowledge Engineering".

Investment costs in chemical industry

The approach paper on the Eighth Five Year Plan which has just been finalised envisages an average annual growth rate of 9% for the manufacturing sector during this period. The chemical industry enjoys the relatively high weightage of 15% in this sector and its progress will have an important bearing upon the overall plan performance. Our ability to achieve the targets for the chemical sector will depend upon our ability to ensure that the projected investments take place without undue delays and, what is even more important, to ensure better utilisation of productive assets to contribute to the national objective of reducing the incremental capital:output ratio from the present level of 4.6 to the projected level of 4.15.

Chemical industry is usually very capital intensive. The capital investment norms have increased significantly in recent times due to various steps needed for the protection of the environment. Comparisons on an international basis show that the costs of Indian projects are about 75% higher than the corresponding costs in the U.S. Gulf Coast. This incidence of comparatively high investment cost has been well-known and has been generally explained away by the supposed inefficiency of the investment process in India. However, a more rigorous examination has become necessary in view of the urgent need to reduce the ICOR.

The most important contributor to the higher investment costs in India is the high incidence of Customs and Excise duties on the import and manufacture of equipment. It may well be argued that the Government compensates the very large upfront levies through the corresponding tax breaks later on. However, it is well-known that the tax-breaks so offered barely suffice to neutralise the interest costs incurred during the project execution period and the subsequent gestation period needed for the project to become profitable. These problems are further compounded by the prevailing high rates of interest which are levied even upon development loans.

The second largest contributor to investment costs is the time needed to clear the procedural hurdles. Even a moderately sized chemical project in India requires an average of seven years for implementation, of which nearly four years are spent in obtaining procedural clearances. While the average consumer price inflation has remained in single digits, the inflation index for equipment and construction industry has been 15% or higher. The higher level of project cost inflation in India, coupled with the four additional years or more which are needed for project implementation, contribute very significantly to the higher project costs by international comparison.

The third, and often overlooked, factor is the additional expenditure required for neutralising the effects of poor infrastructure facilities in the remote regions. Dispersion of manufacturing industry to backward areas undoubtedly provides a focus for the balanced regional development of the country. However, it is clearly unfair to add on the social costs of infrastructure development to the already high level of investment costs borne by the chemical industry.

None of the factors mentioned so far are of recent origin. However, I am encouraged to bring these issues forward in view of the adoption of a lower ICOR as an objective of national policy. I can assure our Honoured Guest that the ICMA would be more than willing to constructively participate in any dialogue that the Department of Chemicals and Petrochemicals may wish to generate with the chemical industry in this matter of vital economic importance.

Cost of chemical manufacutre

Products of the chemical industry are generally used as inputs for the consumable products and they influence the final consumption cost in a significant manner. The price of chemicals in India generally moves in line with international prices. Therefore, we have witnessed in the recent past a very high rate of inflation in line with the hardening of the international chemicals market and the depreciation of the international value of the Rupee. However, there are no two opinions about the intrinsically high cost of chemicals in the domestic market. In my opinion, the recent public debate over the supposedly high subsidy on fertilisers has very well ventilated the problems being faced by the chemical industry in general.

The three major contributors to the high cost of chemicals in India are feedstock prices, energy costs and the relatively small scale of operations. The high price of feedstocks and energy is inextricably linked with revenue raising measures and a relief can come only when the revenue base is broadened beyond its present limits.

Our continuous representations to Government have met with a generally sympathetic response, particularly in the Department of Chemicals and Petrochemicals, but we must admit that the resulting measures have been palliative in nature which have not tackled the main structural deficiencies.

The demand for chemical products in India has been relatively small in size and widely dispersed geographically. Consequently, chemical industry has developed through relatively moderate investments in what are now fairly dense and urban population centres. In certain sectors of the industry such as dyestuffs, leather chemicals and textile auxiliaries, the investment levels have been fractured further through the inducements for small scale industry. These developments have inevitably led to a high level of fixed costs in chemicals manufacture.

The relatively high growth of manufacturing industry in the last decade has now made it possible for us to contemplate economies of scale arising from the expansion and upgrading of existing manufacturing facilities. The policy liberalisation measures announced by the Government from time to time have indeed given ample recognition to these reasonable eco-

ICMA
INDIAN CHEMICAL MANUFACTURERS ASSOCIATION
49th ANNUAL GENERAL MEETING
&
RAJMITRA B.D. AMIN MEMORIAL LECTURE
BOMBAY, SEPTEMBER 27, 1989

Mr. P. Namgyal, Minister of State for Chemicals & Petrochemicals, Government of India, inaugurating the annual general meeting of the ICMA. Seated from L to R: Mr. K.V. Mariwala, Chairman-Western Region, Mr. Atmaram Saraogi, President-Elect, Mr. S.M. Datta, President-ICMA and Dr. R.A. Mashelkar, Director, National Chemical Laboratory, Pune, who delivered the Amin Memorial Lecture.

nomic aspirations of the manufacturing sector. However, these liberalisation measures have not been extended to the chemical industry primarily on locational and environmental considerations. The ICMA has consistently and actively participated in the efforts to improve the environmental impact of manufacturing industry and we are committed to continue our activities in the future as well. We strongly feel the expansion of manufacturing activities can be combined with upgradation of technology and better manufacturing practices to contain and, indeed, to reduce the environmental impact. Therefore, we would once again urge upon the Government to extend the scope of its liberalisation policies with suitable safeguards to the chemical industry as well.

Exports of chemicals

In so far as exports are concerned, the Government has initiated bold and pragmatic policies in recent months. We in ICMA have not failed to take note of this. For example, the policy announced recently to supply feedstocks, raw materials and fuel at international prices for export production is wholly welcome, as also the restoration of duty drawback rates on exports of dyestuffs to 10%. As you are aware, chemical exports have come to be a dynamic factor in our overall export performance. In 1988-89, chemical exports recorded a 75 per cent increase to Rs. 2,112 crores compared to Rs. 1,200 crores in 1987-88. Given the right policy framework and regime of incentives, we are hopeful of achieving a further 50% increase in exports during 1989-90. In recognition of the important role that chemical industry plays in the exports sector, the ICMA had organised a National Conference on Chemical Exports in April this year when we tried to identify certain thrust areas for concerted effort and action. Besides traditional products like dyestuffs and organic & inorganic chemicals, we could identify the possibility of custom synthesis of speciality chemicals in the knowledge and skill intensive segment.

The current world market in speciality chemicals is estimated to vary between US $50 and $100 billion. Speciality chemicals include oil field chemicals, electronic grade chemical, semiconductor grade chemicals as well as chemicals based on biotechnology. The structure of demand in important markets like Europe and North America is expected to undergo drastic changes in the next ten or fifteen years with a higher proportion of demand in favour of fine and speciality chemicals, which may eventually account for 30% or more of the total demand for chemicals. Nearer home, China and South-East Asian countries are expected to present good market opportunities for basic chemicals. Dyestuffs and dye intermediates are the fastest growing segment in exports which accounted for over 25% of the total chemical industry exports last year. With stricter environmental regulations in the developed countries resulting in rationalisation of production, we should be able to achieve a consistently higher export performance in this sector. We in ICMA would recommend a structured consultative approach between Government and the Chemical Industry in order to deal with such issues.

Chemicals from agro resources

The agricultural sector continues to play an important role in our economy not only through its contribution to GDP and employment, but also by providing several basic raw materials for industry.

Given the necessary encouragement and policy support, many valuable chemicals can be derived from agricultural sources and some complex chemicals directly can be extracted from plants. One of the commonest products where we should make a breakthrough is enhanced production and recovery of industrial vegetable oils in which the country is facing a supply shortage. We already produce some basic chemical feedstocks like carbohydrates for starch, alcohol and alcohol-based products and vegetable essential oils, such as lemon grass oil and citronella for the manufacture of fine chemicals.

A variety of other products such as oleochemicals, medicinal extracts, fragrances and flavours can be obtained from agro resources. The major advantages are that such operations are based on renewable plant stocks, which are normally grown in marginal lands, thus providing sustenance to the weaker sections of society and also that the proceses are normally pollution free. These are some of the areas which the Association would like to suggest as relevant fields for organised corporate activity.

Safety, health & environment

The chemical industry generally suffers from a negative image in the public eye as a major contributor to environmental pollution and hazards to public safety and health. No doubt, the very nature of the industry does involve certain risks, but this industry also has one of the best safety records in the manufacturing sector. We in the ICMA sincerely share the concern of the Central and State Governments in this respect. ICMA has, therefore, taken safety, health and environmental aspects as a major area of attention, and over the last few years, a considerable amount of work has been done in this area. This involves not only continuous dialogue with the various statutory and policy making authorities but also collection and dissemination of information to its members and the public at large.

Industry-Government meetings have been held over the last one year in various centres like Madras, Bombay and Calcutta. Several publications have been released including "Code for Safe Transportation of Hazardous Substances by Road" and "Model Onsite Emergency Management Plan". In addition, guidelines on measurement of hazardous substances and guidelines on Occupational Health Service in Hazardous Industries are being drafted and will be issued soon. In collaboration with the Loss Prevention Association of dia, a film on "Transit Hazard verted" has been produced and widely stributed.

The ICMA is grateful to the Minis- y of Environment and the Department f Chemicals and Petrochemicals for ncouraging a constructive dialogue and or supporting some of the suggestions rom industry such as reduction of mport duty on equipment and instru- nents employed for pollution control and safety. We would also request the Government to consider soft loans under the IDBI scheme for financing investments in upgrading safety and environmental measures.

It gives me great pleasure to inform you that the ICMA has been recognised by the Government of India as the representative organisation of the entire chemical industry by co-opting it on various high level committees established by them. I would like to once again reassure the Government of our closest co-operation and support in this common cause of ensuring a better and safer life to those engaged in the chemical industry, as also to the people of the country.

ICMA matters

The Association was founded in 1938 by Acharya P.C. Ray, one of the foremost nationalist visionaries of this century. To perpetuate the memory of the founder of the Association, ICMA has established, in its Golden Jubilee Year, a Trust under which lectures on subjects of relevance to chemical industry will be delivered annually by eminent persons. The first such lecture on "A Strategy for Growth of Chemical Industry in India" was delivered in December last year by Prof. M.M. Sharma, who is a well-known chemical engineer and a technologist in his own right.

During the year, the ICMA continued active contacts with the Chemical Industry Association in UK, the Chemical Manufacturers Association in USA and the Japanese Chemical Manufacturers Association, and participated in several international conferences.

It is a matter of great satisfaction to us, that we were able to shift to our own accommodation in Calcutta and have been able to provide suitable accommodation for our National Headquarters in Delhi.

At the end of this Annual General Meeting, I shall be handing over the office of the President of the Association to my esteemed colleague and Vice-President, Mr. Atmaram Saraogi. The four years of my service in the Standing Committee of the Association have afforded me a challenging and richly rewarding experience. This would not have been possible without the active help, advice and co-operation extended to me during this period by my colleagues on the Executive Committee, the various Regional Committees, the various Sectional Sub-Committees of the Association and the ICMA membership in general. Therefore, I would like to conclude with an expression of my sincere gratitude to my fellow members of the ICMA, with a renewed commitment to the objectives of the Association and, finally, with a warm welcome to the incoming President and the New Committee.'

Inaugural address of Shri P. Namgyal, Minister of State for Chemicals & Petrochemicals, Government of India

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'President of ICMA, ladies and gentlemen,

It gives me great pleasure in being present on the occasion of your Annual General Meeting. Yours is a broad based Association of chemical manufacturers which covers almost the entire range of products being manufactured in the chemical, petrochemical and pharmaceutical industry. You are, therefore, truly representative of the industry in our eyes, and we attach considerable importance to the recommendations made by you to the Government on various policy issues. I have, therefore, been looking forward to listening to the deliberations in today's meeting and being appraised of the problems of this industry.

As you are aware, chemicals have wide ranging applications in a number of consumer sectors. Plastics, drugs and chemicals like toiletries are used by a large number of households in our country and they are directly affected by the availability and pricing of these products. My Department has been trying to improve the availability of all such chemicals, including plastics, drugs and pesticides, which are used by the common man and also to keep their prices at reasonable levels, both by regulatory procedures and by encouraging competitions through liberalisation of industrial policy.

It is a challenge for the members of your Association to take advantage of the healthy industrial climate existing in the country and the liberal policies initiated by the present Government headed by Shri Rajiv Gandhi. You should enter in a big way in the areas where products are being imported at heavy expense of foreign exchange, and should continue to operate your technology and ensure product quality through Research & Development.

As you are aware, Government have identified chemicals as a major growth area for exports. We had achieved exports of Rs. 2,112 crores last year for all chemicals and allied products, showing a growth of 65 per cent over the previous year. This year again a target of Rs. 3,240 crores has been fixed which would show another high growth of about 54% over 1988-89. This is one of the highest growth areas in exports, compared to all other product ranges. Your industry is thus being looked upon by the Government as a major source of foreign exchange earner. This expected high growth will be possible only if the industry produces products which are acceptable in the international market for both quality and price.

This can only be possible if our technology matches the international standards and we operate on processes and designs which lower the cost of production. Continuous upgradation of technology is, therefore, very essential not only for growth in the domestic industry but to survive in the international market. Our effort is to encourage local development of new technologies and to reduce reliance on outside sources for this purpose. This will not only save foreign exchange but also create an industrial culture of high effort in Research and Development.

As you very well know, our country is short of energy sources and all of you have serious production problems with heavy power cuts imposed by different State Electricity Boards from time to time. Similarly the cost of fuel in this country is much higher than international prices. The Government of India is paying increasing attention in the last two years to encourage industry to bring improvements in process design, engineering of the equipments and working efficiency to achieve savings in their energy consumption.

The Government has allowed concessional rate of interest, higher depreciation allowance and lower import duty on energy saving equipment to promote energy conservation in industry. We also want all large units to have an energy audit and set targets for savings in the consumption rates of energy over a short period of time. I would be happy to see some progress being made by the chemical industry in this area and would also urge upon all of you to give a high priority to this subject.

Environmental pollution from the chemical industry is a major threat, not only in India but in the entire world. Our Government is paying much more attention to this field in the last five years than was done before, because we do not want another major tragedy like the Bhopal gas disaster. We have m
rules on the location of units in
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30th June 1988 and my Min
against locating chemical units
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amount of foreign exchange.

My Department and your Associ
have worked together for a long ti
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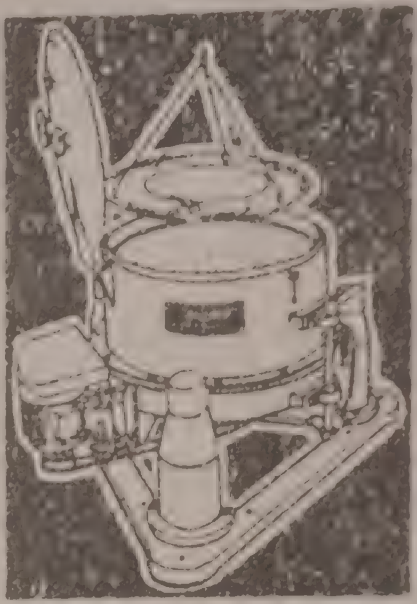

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Greater financial autonomy for ONGC proposed

The Petroleum Ministry has taken up with the Government the question of delegating more financial powers to the Oil and Natural Gas Commission (ONGC). This follows signing of a memorandum of understanding (MoU) for 1989-90 between the Ministry and ONGC. In addition to stipulating what ONGC would be required to do during the period, the MoU has fixed the commitments of the government.

The ministry has urged the Government to equip ONGC with a blanket foreign exchange sanction of Rs. 200 crores annually against Rs. 100 crores at present and enhance the present limit of Rs. one crore to Rs. five crores for foreign exchange expenditure for each item of capital stores and services.

The Government has been further urged to delegate more financial powers to the ministry in matter of release of foreign exchange to ONGC. At present the ministry can sanction foreign exchange up to Rs. five crores and all cases of release of foreign exchange in excess of Rs. five crores are referred to the Department of Economic Affairs. The limit, the ministry feels, should be raised to Rs. 20 crores.

The question of delegating more financial powers for capital investment has also been taken up with the Government. For replacement and renewal of assets due to normal wear and tear, the present limit is Rs. 50 crores in each case and Rs. 20 crores for additional and new investments. The Government has been urged to raise the limit to Rs. 100 crores in each case.

An early clearance of foreign exchange has also been emphasised in the MoU. The Government, it is f should clear proposals with fore exchange involvement ranging betw Rs. one and five crores. The Gove ment, as per the MoU, is also expec to consider ONGC's request for rei bursement of exchange losses on fo ign borrowings due to exchange r variations and loss of interest in pub deposit accounts on which 10 per c interest is paid instead of the comm cial borrowing lending rate of 15 fixed by the Finance Ministry.

Quick decisions are supposed to taken by the Government in respect compensating transit losses at refine points, transportation cost of LPG a activities not viable commercially, rev sion of condensate price and revision price of LPG, natural gas and crude o

The Government should also assi ONGC in recovering dues from va ous state governments and public sect consumers where outstanding exists f more than two years. The Governme will seek to make financial and admi istrative arrangements that will he ONGC undertake, through its subsic ary, exploration activities in forei countries, particularly in those basi which are more prospective than tho available domestically.

The Government has further decid to clear investment proposals for pr jects within 90 days from the day submitting the feasibility report.

However, ONGC's experience so f has not been too satisfactory. As ma as six projects have been identified a placed before the government with co estimates for an early clearance. Th time limit suggested in the MoU h already expired, but nothing has ha pened. The projects include South Ba sein gas field phase one (revis estimates), development of Panna fiel R-series development. NGL fraction plant (phase one kerosene recove unit), mid-south Tapti and western of shore integrated development projec

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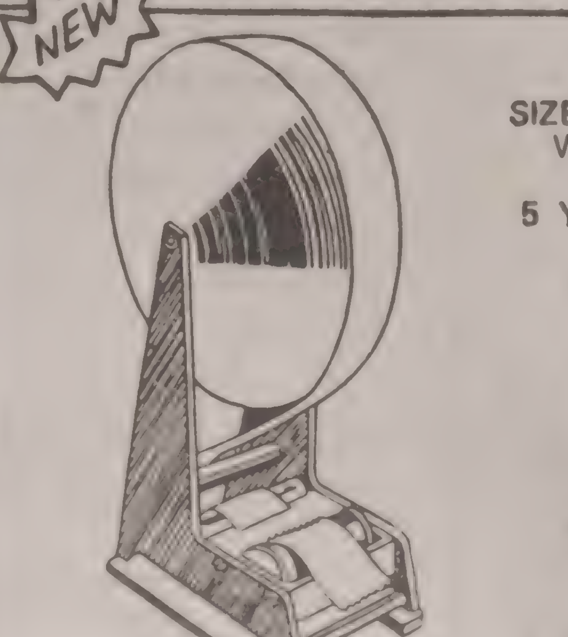

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ONGC DECENTRALISATION

Independent companies for select areas

With a view to decentralising its functioning, the Oil and Natural Gas Commission (ONGC) has decided to set up independent subsidiaries for certain identified areas which at present form a part of its expanding operations.

In addition to this, the experiment of creating subsidiaries as independent companies also envisages delegation of authority down the ladder and commercialisation of all such functions which are being taken up as departmental ones. The first such venture, to be known as 'Well Stimulation Services (WSS)' is to be set up soon.

The WSS centre, with headquarters at Ahmedabad, would have three other onshore operating bases at Sibsagar in Assam and Karaikal in Tamil Nadu and Rajahmundry in Andhra Pradesh.

The total capital cost for the subsidiary company is estimated to be about Rs. 20 crores. However, only Rs. 4.75 crores cash outgo is estimated, as major resources for WSS working already exist with ONGC.

According to official sources, WSS activities can be broadly divided into three heads: Stimulation services, specialised production services, and R and D back up.

The aim of the stimulation services is to increase the production from the well. The various stimulation operations that can be carried out are hydrofracturing, acidising and surfactant treatment.

The laboratory operations are critical in identifying the most effective and efficient solution to a broad range of oil field problems.

The characteristics of each individual well need to be studied which requires reference to an extensive data base and the use of the relevant technologies to analyse core materials, oil-field fluids and properties of potential treatment fluids.

WSS, to start with, would form three main bases: Ahmedabad, Sibsagar and Karaikal and a satellite base at Rajahmundry. Seventy per cent of the work load during the Eighth Plan would be attended to by WSS and the rest by hiring suitable outside agencies.

The well stimulation service operations are included in the broad category of work-over operations. Periodic work-over operations have to be carried out from the existing producing fields in order to maintain the flow of production.

The wells may have to be worked over owing to many reasons, which may range from choking of the well tubing, to the productivity impairment to the excessive water production alongwith oil.

None of the WSS services is routine in nature and specific services are to be provided on call basis depending upon the situational requirements. Very few international companies like Dowell Schlumberger, Halliburton, Nowsco and the Canadian Fracmaster, are engaged in carrying on the tasks similar to those of WSS.

In ONGC, the workover rigs have increased from 32 (as on April 1, 1981) to 52 (as on January 1, 1989). The wells under servicing have been reduced from 434 in 1980-81 to 286 during 1988-89.

In percentage terms, the number of wells under servicing in comparison to the total number of wells was 23.82% (1980-81) which has been reduced to 7.24% in 1988-89. The productivity of work-over rigs, i.e. the number of wells worked over per year, has increased from 4.58 in 1980-81 to 10.8 in 1988-89 resulting in substantial increases in production.

RECORD SHOW BY PLASTICS FIRM

Prince Plastics, a city-based firm has won an export award for 1988-89.

The company has been winning export awards every year for the past seven years. Mr. Arvind Mafatlal, industrialist, presented the award for 1988-89 to Mr. Jayant Chedda and Mr. Mahendra Chedda of Prince Plastics. The company has diversified into export products such as SWR system and PVC fittings. Prince Plastics products are exported to over 25 countries including Europe and the Far East.

The company has now embarked upon a major diversification plan in the field of plastic furniture. Its existing product range includes PVC pipe fittings (pressure as well as non-pressure), SWR drainage systems, PVC pipes and industrial crates.

JOINT PANEL OF DRUG BODIES FORMED

A joint committee of the pharmaceutical industry has been formed with representatives of three manufacturers' organisations — India Drug Manufacturers Association, Organisation of Pharmaceutical Products of India and Pamdal, and the trade body, All India Organisation of Chemists and Druggists.

The committee is to provide a common forum for all issues relating to the manufacturers or the trade and also will undertake to make joint representatives in respect of such issues to the Government.

It will shortly submit certain proposals relating to outstanding matters concerning both the manufacturers and the trade together with a time-bound programme for their implementation.

ONGC'S WESTERN OFFSHORE DEVELOPMENT PLAN

PIB calls for fresh appraisal

The much-trumpeted Western Offshore Integrated Development Plan (WOIDP) of the oil and Natural Gas Commission (ONGC) has run into another roadblock. The Public Investment Board (PIB) has refused to consider the plan for approval, on the ground that the plan has been substantially revised and hence a fresh appraisal process should be followed.

Therefore, the board is understood to have told the Petroleum and Natural Gas Ministry to refer the revised project for consideration at a pre-PIB meeting. The plan should then come up before PIB after following the routine two-stage clearance formula.

WOIDP was originally conceived about a couple of years back as a Rs. 900-crore project for developing satellite fields of Bombay High in an integrated manner, providing a standby system to continue oil and gas production from the western offshore in case of emergency and for undertaking the renovation of the existing Bombay High-Uran trunk pipeline.

The plan also envisaged a trunk pipeline in the northern sector from Bombay High to Hazira via Panna field, for carrying oil under normal operating conditions, to Hazira for Koyali, Mathura and Karnal refineries. The plan had proposed creation of crude-handling facilities at Hazira and laying of a trunk pipeline from Bombay High to Uran via Heera field.

One of the main objectives of this project was to avoid flaring of gas in the western offshore fields by transporting them to onland areas through an integrated link of pipelines. The project would also have created an alternative pipeline network for transporting crude and gas from the western offshore, which could be used in the event of an emergency.

The project, however, got bogged down in controversies. Experts questioned the need for such a huge investment and opined that the resources meant for the project could be utilised with higher returns in some other related area.

Despite these reservations, the project proposal was put up before PIB, which while agreeing to its broad approach referred it to be examined by a group of ministers. This meant a stumbling block to the smooth clearance for the project and delay.

The group of ministers opined that an expert group should go into the feasibility and need for such an ambitious project. Thus in April 1988, an expert group headed by Mr. Lovraj Kumar was set up. The group finalised its report in February this year and recommended that the project be implemented in two phases.

What influenced the expert group to split the project into two phases was the Defence Ministry's view that there is no need for WOIDP, since the existing sub-sea oil and gas pipelines cannot be military targets. One of the arguments cited to support WOIDP was that an alternative pipeline network in the western offshore would act an as emergency back-up in the event of military attack on the existing pipelines.

The expert group's report had in fact prepared the ground for reducing the scope and the size of the project. Although the project would have the second phase on paper, in reality the project would be truncated to what has been outlined in the first phase.

Quite expectedly, on the basis of this report, the Petroleum and Natural Gas Ministry decided to take up the first phase for implementation and wanted ONGC to prepare a fresh feasibility report. The fresh report for the first phase showed that the cost of the project has declined to about Rs. 230 crores and the pipeline proposed to be laid would only be about 144 kilometres long.

With a view to cut down any further delay, the Petroleum and Natural Gas Ministry sent the revised project proposal directly to PIB in the Finance Ministry for its clearance. But PIB's stand that it should be re-routed through a pre-PIB meeting and other formalities has meant that more delay would take place.

Sources say there is merit in the PIB argument that a fresh appraisal is needed because the revised project is substantially changed from what it originally was. Similarly the argument of the Petroleum and Natural Gas Ministry that a fresh appraisal would entail further delay and cost escalation also has a strong logic and merit.

PIB, however, appears to be quite keen that all procedural formalities are followed in respect of all petroleum projects. In fact, PIB had only recently sent back six of ONGC's projects to the Petroleum and Natural Gas Ministry on the ground that they had ben directly sent for the second-stage clearance without obtaining the first-stage approval.

SYNTHETIC FIBRE UNIT IN SOUTH

Page 57 of Chemical Weekly dated 19.9.89 contains an article on the proposal of JK Synthetics Ltd. for the manufacture of PTA. In the last sentence of this article it has been inadvertently mentioned that "there are no synthetic fibre units in the South". This is contrary to the facts. Indian Organic Chemicals Ltd. are engaged in the manufacture of polyester staple fibre and partially oriented yarn/polyester filament yarn at Manali, near Madras. The error is regretted.

OIL plan to raise output in Eighth Plan

Oil India Ltd, has drawn up an ambi- ous plan, including introduction of hor- ontal drilling to raise its annual oil roduction by more than one million nnes during the Eighth Plan period.

Annual production is expected to each four million tonnes in the termi- al year of the Eighth Plan, according o Oil India, Chairman and Managing irector, Mr. S. Chaliha.

Steps being taken to boost output nclude the introduction of horizontal rilling in the ageing Nahorkatiya oil ield in Assam. The company expects o double the output from the Nahor- atiya field, which produces a little over ne million tonnes crude per year.

Companies seeking to squeeze more il out of old fields are now turning to orizontal drilling, a technology with ne potential to increase output. Drilling t an oblique angle to well hole, rather nan going straight down as in vertical rilling, taps more oil bearing formation. his new drilling technology will be ntroduced in the country for the first me by Oil India.

But the costs of horizontal drilling are bout 50% higher than those of conven- ional vertical drilling.

Oil India is confident of a major surge in its operations during the Eighth Plan with the co-operation of the Assam Government and the Centre. Political disturbances in Assam had hit Oil India's operations in recent years and its crude production declined from 2.75 million tonnes in 1984-85 to 2.42 million tonnes in 1988-89. Production in the current financial year is expected to recover to 2.73 million tonnes.

The company has proposed an Eighth Plan outlay of Rs. 1,750 crores of which Rs. 1,400 crores will be financed through internal resources. During the five-year period, the company plans to drill 83 exploratory wells and 255 development wells.

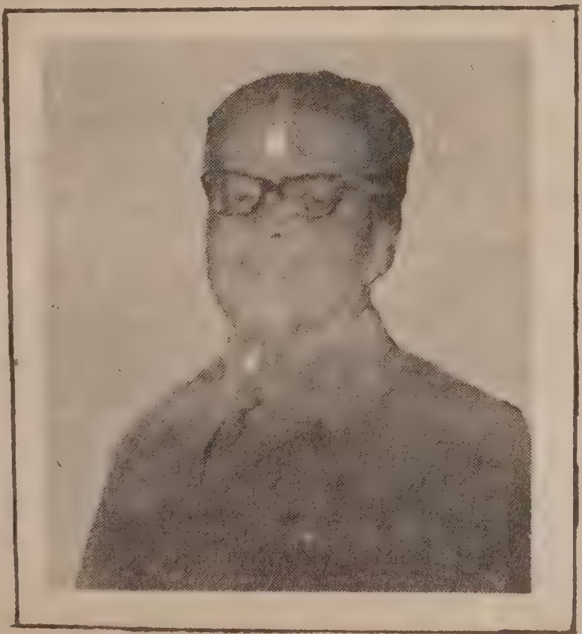
Oil India has made a provision of Rs. 78 crores for exploration in Kutch-Saurashtra offshore and Rs. 105 crores for Ganga valley. Survey and drilling activities in Rajasthan, Orissa offshore, Andamans, Kutch-Saurashtra offshore and Ganga valley will be carried out through chartered rigs.

The highlights of Oil India's future programmes in the north east include a plan to participate in a gas cracker project near Jorhat, and onshore drilling activities in an 8,000 sq-km area on the northern bank of the Brahmaputra river for which a French firm will conduct the seismic survey.

Oil India has also drawn up two projects to stop flaring of associated gas in the oil fields of upper Assam. The country's first gas storage-cum-reproduction facilities are being set up at Duliajan. At present, about 30% of the produced associated gas in Assam is being flared mainly because consumers do not lift the gas committed to them. The gas storage-cum-flowback project will prevent natural gas wastage and help maintain sub-surface pressure by being reinjected into the underground reservoirs.

The measure will also effectively manage the supply of gas to the market, whereby during low demand periods, gas will be stored and at peak demand, it can flow back. The sizable gas reservoir discovered in Tengakhat area near the Assam oilfields should produce at least 2.5 million cubic metres of gas a day, when developed.

Oil India has engaged a reputed British consultant to assess the reservoirs and to work out a development plan of these non-associated gas reservoirs. The company has recently committed one million cubic metres of gas per day to a new customer, North Eastern Electric Power Corporation (NEEPCO), for a 270 mw combined cycle power generation plant at Kathanguri in the Nahorkatiya-Jorajan oilfield areas.



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Tech. upgradation schemes for copper units planned

The Union Government is concentrating upon a major programme for technological upgradation of copper production facilities which so far have relied on the technology of the sixties.

Disclosing this at a seminar organised by the Indian Copper Development Centre at Calcutta on Sep. 24, Mr. P.K. Lahiri, Secretary of the department of mines, said India was nowhere near self-sufficiency in non-ferrous metals as would be evident from the fairly large level of imports year after year. Mr. Lahiri also said the department of mines would welcome R and D efforts by the non-ferrous metals sector even if it amounted to taking short-term risks.

Speaking in the same vein Hindustan Copper Limited Chairman and Managing Director Mr. P.V Venkatesan, said HCL had launched an action plan to modernise its plants and works during the Seventh Plan in order to update copper production technology and remove bottlenecks in production. The continuous cast rod plant at Taloja was now ready for commercial production and would help HCL meet the complete needs of electrical sector, he added.

Assuring the industry that HCL would fully support research and development initiatives, Mr. Venkatesan said the company was now meeting the sophisticated requirements of the electronics, space, atomic energy and telecommunication industries. Besides, HCL has also achieved significant progress in the area of precious metal recovery due to in-house R and D efforts.

Meanwhile, HCL has identified new deposits in Singhbhum and Khetri belts for production of cobalt, nickel and molybdenum. Besides, plans are afoot to extract copper by the hydrometallurgical process route from the stockpiled oxidised ores in Malanj Khand by dump leaching. Mr. Venkatesan said that the proposed facilities would add about 750 tonnes per annum of cement copper to the total copper output.

The HCL Chairman said that copper sales in the country has increased from 8,000 tonnes in 1970-71 to around 50,000 tonnes in 1988-89 against the mine output of 5.05 million tonnes of copper ore, 44,840 tonnes of blister copper and 39,596 tonnes of cathodes. Stating that these were "all time records" in mining and metallurgical works, Mr. Venkatesan added that the production represented 94% capacity utilisation. Others who spoke on the occasion included Dr. Dara P. Antia, president of ICDC, and Dr. L.R. Vaidyanath, director of ICDC.

DPR APPROVED FOR NALCO EXPANSION

The Union Government has approved the preparation of a detailed project report for expanding the capacities of National Aluminium Company's (NALCO) Orissa units by 50% and the addition of downstream facilities for the production of rolled products.

This was disclosed by the NALCO Chairman, Mr. K.V.B. Pantulu, at the annual general meeting of the company on September 30. Mr. Pantulu said to broaden the product mix and to create growth opportunities, it had been planned to implement schemes for production of 10,000 tonnes of billets, 5,000 tonnes of aluminium alloy conductors per annum. These would be financed by the company's internal resources.

SALT REFINERIES TO BE ENCOURAGED

The Union Government has decided to encourage establishment of fisheries and refineries for purification of salt. Guidelines have been issued in regard, an official release said. The S Department, with its headquarters Jaipur would function as the no agency for registering the units a would receive, process and regis applications. The primary salt prod ers, either individually or jointly, wo be encouraged to establish salt upg dation.

New industrial undertakings wou be encouraged to set up salt refine washery in salt producing areas. Th industrial undertakings already regi tered under MRTP Act and FERA a required to obtain clearance from th Department of Company Affairs or an other agency with whom they are reg istered. The chlor-alkali units whic have established their captive salt work would also be permitted to establish sa upgradation plants.

INDIAN STANDARDS RELATIN TO CHEMICALS

The Bureau of Indian Standards ha published the following new and revise Indian Standards relating to the field o chemicals:

IS: 101 (Part 2/Sec 1)-1988: Method of sampling and test for paints, var nishes and related products: Part 2 test on liquid paints (chemical examination) Section 1 water content (**third revi sion**).

IS: 3972 (Part 2/Sec 3)-1988: Metho of test for vitreous enamelware: Part 2 test methods, Section 3 resistance t boiling water and water vapour (**first revision**).

Copies of the Indian Standards are available, from the Sales Services at BIS Headquarters at New Delhi and Regional and Branch Offices located at: Bombay, Calcutta, Chandigarh, Madras, Ahmedabad, Bangalore, Bhopal, Bhubaneshwar, Guwahati, Hyderabad, Jaipur, Kanpur, Patna and Trivandrum.

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Soaps, detergents to cost more

A sharp rise in the end consumer prices of two essential mass consumption products, i.e. soaps and detergents, appears inevitable. The prices of both product categories had remained stable almost throughout 1988 and the first half of 1989.

Sounding this warning at the 55th annual general meeting of the Indian Soaps and Toiletries Makers' Association (ISTMA) held at Bombay on September 25, Mr. P.M. Sinha, ISTMA President, said that the association had drawn the attention of the Government to the factors contributing to the expected price increase.

Mr. Sinha said that the Government had in August suddenly withdrawn the rebate on use of minor oils and oils of tree and forest origin. Following the withdrawal of this rebate, the prices of popular soaps which were so far, just below the threshold level of Rs. 30,000 per tonne would now attract a substantially higher excise duty, to the tune of 40 paise more per tablet. Mr. Sinha expressed the hope that the Government would rationalise the excise duty structure on toilet soaps in the light of the withdrawal of rebate on use of minor oils, and also reinstate the minor oils rebate.

The ISTMA President cautioned that unless the rebate was reinstated at an early date, the country was exposed to the risk of losing an additional production of two lakh to two and a half lakh tonnes of minor oils during the next three to five years. This would necessitate increased levels of imports, he added.

Mr. Sinha attributed the imminent increase in consumer prices of synthetic detergents to the recent sharp hikes in the prices of LAB and soda ash, which were critical raw materials. Such a sharp price escalation of critical raw materials would adversely affect the growth of the synthetic detergents industry and hit the consumer hard, Mr. Sinha felt.

The President expressed deep concern about the sharp increase in transport costs as a result of the revised Motor Vehicles Act. The transport charges for both raw materials and finished products being manufactured by the members, increased between 35 per cent and 50 per cent. The association had represented to Government to implement a more pragmatic Motor Vehicles Act.

The ISTMA chief also pleaded for a reduction in excise duty on toiletries and cosmetics. The current high level of excise duty (110 per cent) had slowed down the growth of the industry and affected the flow of revenue to the Government. Besides, it had inadvertently encouraged the production of spurious products and counterfeits, which were harmful to consumers and harm the image of popular brands, he argued.

TIWARI OPENS LEVER DETERGENT PLANT IN UP

The Chief Minister of Uttar Pradesh, Mr. N.D. Tiwari, inaugurated Hindustan Lever's first synthetic detergent factory in Uttar Pradesh on October 1. A toilet soap factory will be commissioned later in the month.

The detergents factory is at Sumerpur in Hamirpur district, a Centrally notified backward area, about 80 km away from Kanpur. The soap factory is located at Orai in Jalaun district. Both the plants will add substantially to the company's turnover in the coming years.

Set up with a capital investment of Rs. 15 crore, the detergents plant has been designed to produce 30,000 tonnes per annum of detergents, most of which is expected to be consumed within Uttar Pradesh. On achieving the rated capacity, the plant will contribute a sales turn over of over Rs. 50 crore, besides gene rating a revenue of about Rs. 15 cror every year by way of excise and sale tax to the Central and State exchequer

The detergents factory, which repre sents one of the first investments to b made in this industrially backwar region, will generate direct and indirec employment for over 500 persons. Several new ancillaries are expected t spring up in the region.

The Orai factory will manufactur 35,000 tonnes per annum of toilet soap This project involves a capital outlay o Rs. 22 crore. Work on the constructio of a satellite unit at Pithorgarh in progress. The value of production from th Orai/Pithorgarh units will be in exces of Rs. 100 crore per annum. The reve nue to the exchequer will be of the orde of Rs. 24 crore every year.

The company has also granted per mission to invest in a fatty acid plan at Orai with a capital cost of over Rs. 1 crore. Since 1964, all new projects o the company have been located in th backward regions. Hindustan Lever cur rently has units in 14 backward region located in five States and a Union ter ritory.

IFFCO

The Indian Farmers Fertilisers Co perative Limited (IFFCO) has env saged an expansion programme at a co of Rs. 25,000 million to diversify in the areas of petrochemicals and plast products used in agriculture & indust and to expand fertiliser productio Deputy manager of IFFCO Dr. G. Shrotriya told newsmen that a propos to this effect has been submitted to t Union government for approval. T company would also produce caprola tam a raw material used in textile ma ufacturing. With the expansion at Aon and Kandla, IFFCO would produce lakh tonnes of fertilisers annually against the seven lakh tonnes now.

YNTHETIC RUBBER

Move to enlarge capacity resented

Rubber growers have expressed serous apprehensions over the Centre's move to further expand the country's synthetic rubber capacity. The government proposal involves increasing the production capacity of styrene butadiene rubber (SBR) and poly butyl rubber (PBR) from 40,000 tonnes per annum to about two lakh tonnes, so as to restrict the foreign exchange outgo on imports.

Since PBR and SBR are perfect substitutes for natural rubber, the government's move has triggered off alarm signals. According to Mr. Joseph Monipally, general secretary, the All-Rubber Growers Federation, this would result in long-term slump in prices of natural rubber which in turn would affect the livelihood of 80 per cent of the small rubber growers.

About 70 per cent of the rubber production is accounted for by the small growers, whose holding is less than one hectare. Consumption of synthetic rubber is in the region of around 80,000 tonnes a year of which about 50,000 tonnes, are mostly SBR/PBR grades, while the remaining 30,000 of mostly speciality grades are imported.

Currently, the major manufacturers of SBR/PBR are the public sector Indian Petrochemicals Corporation Limited (IPCL) and the private sector Synthetics and Chemicals Limited (SCL), whose production capacities are 10,000 and 40,000 tonnes respectively.

SCL has been permitted to double its capacity to 80,000 tonnes simultaneously. Official sources said Reliance Petrochemicals Limited has been issued a letter of intent to set up a one lakh tonne PBR plant.

If the natural rubber was substituted with synthetic rubber, Mr. Monipally said it would result in generation of employment to about 15 lakh people, entailing an investment of just Rs. 2,100 crores.

However, if the government went ahead with the synthetic rubber proposals, the capital costs would be around Rs. 3,000 crores and the subsequent employment generation would just be around a 'few thousands'.

RUBBER INDUSTRY — DECANALISE IMPORT OF RAW MATERIAL: DEORA

Bombay Regional Congress-I Committee (BRCC) president, Mr. Murali Deora, observed that decanalisation of imports of raw material required for the Indian rubber industry should be for the steady growth of the industry.

Addressing the 37th annual general meeting of the All India Rubber Industries Association (AIRIA) at Bombay on September 23, he said, liberalisation of industrial policy along with the decanalisation of imports would be the answer to the problems currently faced by the industry. A variety of regulations would retard the growth of the industry, he added.

Earlier, president of AIRIA, Mr. R.K. Raman, urged the government to reduce customs duty on special purpose synthetic rubbers, not manufactured indigenously to a nominal level, and also not to charge countervailing duty on these rubbers, and to change the definition of the synthetic rubber as there were changes in the processing technology.

Urging the government to identify export hurdles faced by the non-tyre sector and grant relief like enhancement of duty drawback and CCS rates, he assured that granting incentives would be fully compensated by higher exports.

He also said only a shift in the drifting attitude coupled with longterm realistic and pragmatic integrated approach, could solve the problems.

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MRPRA ANNUAL REPORT FOR 1988

Progress in rubber technology highlighted

The Malaysian Rubber Producers' Research Association (MRPRA) celebrated its Golden Jubilee last year. In the MRPRA Annual Report for 1988, just issued, both the jubilee celebrations and progress in research and development last year are reviewed. Datuk Ahmed Farouk bin Hj S.M. Ishak, Chairman of the Malaysian Rubber Research and Development Board (MRRDB) and Controller of Rubber Research, comments in his foreword to the report that in the last fifty years 'scientists working in the Association's laboratories have been largely responsible for the understanding of the properties of natural rubber and its development as a scientifically based material'. He continues: 'not content to rest on its laurels, the Association continues to develop new polymers and compounds that will shortly enter the market'.

Newly commercialised developments, and others approaching this stage, are reviewed in the report of the Director, Dr. C.S.L. Baker. Further moves were made in 1988 towards establishing commercial supplies of thermoplastic materials (**DVNRs**) based on Standard Malaysian Rubber and of the chemically-modified natural rubber, **Epoxyprene.** Both these new materials are to be produced and marketed under licence: (DVNR) by British Vita Plc. in the UK and Teknor Apex Company in the USA; Epoxyprene by Kumpulan Guthire Sdn Bhd in Malaysia. MRPRA continues to be involved, in collaboration with these companies, in evaluation of the new materials and production scale up.

A spin-off from earlier work on epoxidised natural rubber has been the development by MRPRA of a superior liquid natural rubber. Further scaling-up of this process will be carried out by the Association's sister institute, the Rubber Research Institute of Malaysia in Kuala Lumpur.

Substantial progress has also been made recently in the commercial application of the rubber based isolation system for earthquake protection pioneered by MRPRA. Following its successful use for the Law and Justice Centre in San Bernardino, California, similar systems have been installed in other buildings in the USA, Japan and Europe. In Japan, where seismic base isolation has been adopted with enthusiasm, the trend is now away from the complexity of supplementary dampers and towards the inherently high-damping MRPRA system.

As Dr. Baker says in his introduction to the Director's Report, 'research and development programmes have proceeded apace'. Details of work in all areas are given, but the introduction concentrates on two examples where effort has been intensified to meet changing needs and opportunities in the market place: in truck tyre retreads and latex dipping.

The work on truck tyre retreading has now been given 'new direction and greater emphasis' by the award of a UNIDO-funded project to develop natural rubber based materials for precured retreading. Modern plant has been purchased and the resulting tyres will be tested in the UK and five other countries. Staff from nine member institutes of the International Rubber Research and Development Board will be trained at MRPRA, thus contributing to the transfer of the latest precured retreading technology to the rubber producing countries.

Another area in which there has been increased effort is that of latex technology, where work has been considerably influenced by the needs of the latex goods manufacturing industry. The 'enormous surge of interest in the manufacture of disposable examination gloves' has led to increased demand for the expertise of MRPRA's latex technologists, who are 'among the most knowledgeable in the world'. This expertise is available through MRRDB's Technical Advisory Service, and through Rubber Consultants. This involvement with industrial problems has led to a new project to improve the production process for examination gloves. A current project which can be expected to impact on materials use within a few years is that aimed at characterisation of rubber/rubber blends by NMR spectroscopy of swollen vulcanizates. This technique has been further developed over the last two years and has already provided interesting results concerning the uneven distribution of vulcanising ingredients between the phases of certain blends. The use of chemically modified rubbers to obtain a more even distribution, and thus better physical properties, is being studied.

To mark the Association's Golden Jubilee, 1988 saw the publication of a 'comprehensive and definitive survey of current natural rubber science and technology': the book **Natural Rubber Science and Technology** written by past and present members of staff, edited by MRPRA's deputy director, and published by Oxford University Press. The book describes the Association's contributions in every aspect of this broad subject over the last 25 years.

PERSONALITIES

Shri Sharad Kumar Jain, President, DCW Ltd., Bombay, and **Shri Umaid Singh Baid,** President (Renukoot Division), Kanoria Chemicals & Industries Ltd., Calcutta, have been unanimously elected President and Vice-President respectively of the Alkali Manufacturers' Association of India, Bombay, for the year 1989-90.

Dr. L. Ramakrishnan of Indofil Chemical Co. and **Mr. R.V. Adarkar** of NOCIL and **Mr. K.K. Unni** of Hoechst have been elected chairman and vice-chairman respectively of the Association of Basic Manufacturers of Pesticides.

Bhatnagar Awards announced

Dr. B.D. Kulkarni, Scientist, Chemical Engineering Division, National Chemical Laboratory (NCL), Pune, has been awarded the Shanti Swarup Bhatnagar Prize for engineering and technology for 1988. The prize consists of Rs. 50,000 in cash and a scroll of honour.

The Bhatnagar Prize, instituted in 1957 by the Council of Scientific and Industrial Research and given each year for outstanding contributions to science including engineering and technology, is the most coveted award amongst the scientists and technologists in India.

Dr. Kulkarni has made significant and original contributions to the design and modelling of chemical reactors, especially the fluidised bed reactors, and the analysis of stability behaviour of reactions and reactors.

He has developed a new formalism, viz., stochastic methods, for analysis of chemically reacting systems. His recent work on arithmetic analytical approach to the solution of equations has far-reaching implications since it has a very wide scope of application in many branches of science and engineering.

Dr. B. Bhattacharya of Bose Institute, Calcutta and Prof. M.R.S. Rao of Indian Institute of Science, Bangalore, have been given the award in biological sciences.

Prof. K. Kishore of Indian Institute of Science Bangalore, has been selected in chemical sciences.

Dr. S.K. Tandon of Delhi University has been awarded the prize in earth sciences.

Prof. S. Prasad of Indian Institute of Technology, Delhi has been given the award in engineering sciences.

Prof. D. Kumar of Jawaharlal Nehru University, New Delhi, and Prof. O.N Srivastava of Banaras Hindu University have won the award in physical sciences.

CSIR AWARDS PRESENTED

Ten scientists have been awarded the 1989 'Young Scientists' prizes instituted by Council of Scientific and Industrial Research to promote excellence in various fields of science and technology.

As is the tradition, the awards were given to the scientists on September 26, being the CSIR foundation day. The awards consist of Rs. 10,000, a citation and a momento given to scientists below 35 years in five disciplines of science and technology.

Dr. G.S. Shukla of the Industrial Toxicology Research Centre, Lucknow and Dr. Ghanshyam Swarup of the Centre for Cellular and Molecular Biology, Hyderabad have been awarded the prize for biological sciences.

The award for chemical sciences has gone to Dr. Chary of the Indian Institute of Chemical Technology, Hyderabad and Dr. Sourav Pal of National Chemical Laboratory, Pune.

In the field of earth sciences, the prize has been bagged by Dr. Rajiv Nigam of the National Institute for Oceanography, Goa and Dr. Piyush Pal Roy of Central Mining Research Station, Dhanbad.

The engineering science award has gone to Dr. A.K. Saxena of the Indian Institute of Petroleum, Dehradun and Dr. D.D.N. Singh of National Metallurgical Laboratory, Jamshedpur.

The award for physical sciences has gone to Dr. Jayantakar of National Physical Laboratory, New Delhi and Dr. V. Shubha of National Aeronautical Laboratory, Bangalore.

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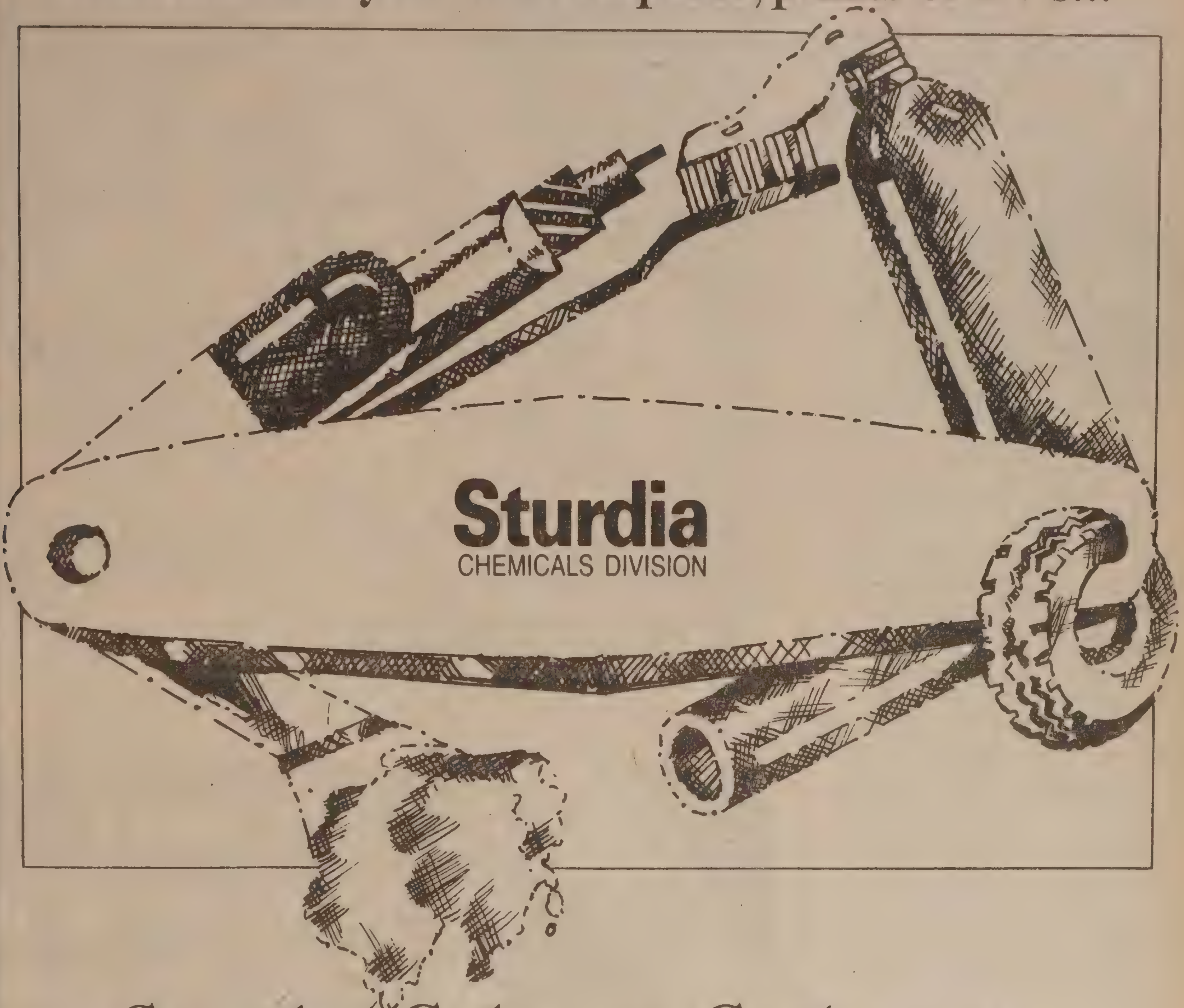

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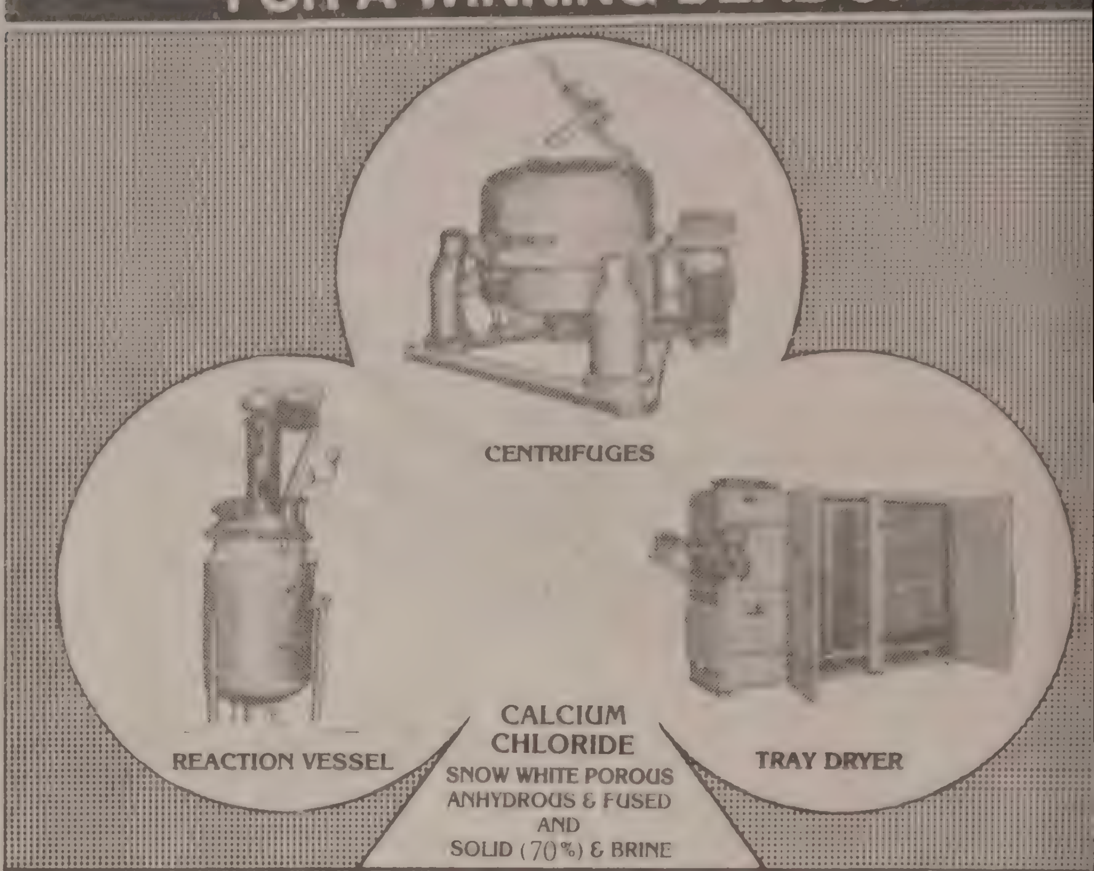

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SPOTLIGHT ON

Biotechnology and Life Sciences (Part 1)

A COMPUTER-BASED BIO-ENGINE FOR PHARMACEUTICAL R & D

The most powerful computer system available for analysing, modelling and designating biologically active molecules and polymers has been launched by Proteus Biotechnology and Norsk Data.

The BioEngine combines for the first time expertise from the different areas of hardware, biochemistry, pure mathematics and programming to produce a flexible tool.

Pharmaceutical companies are spending big money on R & D and competition is intense. Each new product can take 12 years to reach the market at a cost of up to £100 million and many more potential products have to be abandoned in the process. The developers believe that the BioEngine could reduce the cost of the chemical development by up to 90% and cut the development time by 2-3 years, saving money and allowing companies to explore a wider range of products.

What can the new system do? By using quantum mechanics, molecular dynamics, simulated kinetics, gene data and structures of proteins and small organic molecules it can address a range of problems in pharmaceutical, veterinary, agrochemical and biodegradable products.

Proteus itself has a number of compounds designed on the BioEngine that are now being tested in the laboratory. These include:

* A drug for the treatment of prostrate cancer.
* An animal neutering compound.
* Possible synthetic peptide based AIDS vaccines.
* A polymer antiskid runway coating.

The BioEngine is driven by GLOBAL a fifth generation computer language and expert system. Software is optimised to run on the Norsk Data 5000 series of super minicomputers but large design problems may need super computer power.

The system is open ended so it never dates and is user friendly — a scientist can add to it and develop his own programme, as he goes along to make use of his own knowledge. Some of the latest artificial intelligence ideas are incorporated, including fuzzy logic and neural nets.

The BioEngine can also pick out unlikely projects — for example, by estimating potencies. However, toxicity testing is still essential because the system cannot predict what will happen in the body.

As far as buying the BioEngine is concerned, the biggest system with super computers and transputers, will set you back a cool £ 22 million, but lower cost add on options suited to IBM PCs start as £ 5000. (*Chemistry In Brit*, 7/1989 p. 679).

THE THREAT OF ECO-REFUGEES FROM GLOBAL WARMING

Global warming could prompt mass migration, involving up to three hundred million eco-refugees during the next century, Sir Crispin Tickell, Britain's ambassador to the United Nations, warned recently.

Areas most at risk of climate change include the Northern Mediterranean, the American Mid-west and the Southern part of the USSR. In each place farmers could be forced to move as rains fail. In other areas, such as Bangladesh and the Nile delta, flooding could inundate areas occupied by millions of people. Tickell warned in his speech on the World Environment Day about the hazards of global warming. Tickell called for a programme of international action covering population control, energy conservation, reafforestation and containable development. (*New Sci.*, 6/10/89, p. 25).

BACTERIUM WITH A VACCINE IN ITS TAIL DEVELOPED

Researchers at Stanford University, California have found a new way to package a foreign protein into the tail or flagellum, of a bacterium, in order to produce a potential vaccine. Proteins isolated from an organism that causes diseases may trigger an immune response from the body without causing illness, but the response may be weak or absent. The immune system in mice responds readily to flagellum of a bacterium, so by incorporating a foreign protein into the flagellum, researchers may ensure that the system 'notices' the foreign substance and activates its defences.

Stanford researchers have inserted part of the gene that produces a toxin in cholera into the gene that produces flagellum, a protein in the tail of a strain of salmonella. They used the cholera gene as a model for testing the response of the immune system of mice to the resulting 'chimeric' or altered flagellum.

The results were encouraging. The bacteria carrying the altered gene had functional flagella and could shine easily. More importantly, protein made from the cholera gene was incorporated into these flagella. The immune system of mice recognised the foreign protein, or antigen, in the flagella and the mice produced antibodies to the cholera toxin.

According to the researchers the technique could allow scientists to introduce several copies of the same inserted material, so increasing the chances of a strong response from the host's immune system without disabling the bacteria. Even inserted genetic material three times as long as the cholera gene does not disrupt the way the flagella works. (*Science*, Vol. 244, p. 70, *New Sci.*, 4/29/89, p. 38).

NEW LIGHT ON THE EVOLUTION OF FLOWERING PLANTS

Flowering plants may have existed on Earth some 200 million years earlier than can be confirmed by fossil evidence report researchers at Max Planck Institute for plant breeding in Cologne, West Germany. Using changes in the necleotide sequence of a slowly evolving enzyme called glyceraldehyde 3-phosphate dehydrogenase as a 'molecular clock', the researchers calculate that the ancestors of modern flowering plants were already diversifying more than 300 million years ago.

Fossil records for these plants go back only 120 million years. To confirm the accuracy of their clock the researchers compared the nucleotide sequences of nine flowering plants, six animals and one yeast. They find an essentially uniform rate of change in the nucleotides both over this wide range of species and over time. (*Nature*, 339, p.p. 16, 46).

MICROORGANISMS REMOVE METAL IONS TO PRODUCE 'CLEAN' COAL

Recent discoveries that metal ions are an integral part of coal structures may lead to a way of using microorganisms for more effective coal liquefaction in future.

In one programme, researcher David Quigley of EGCG Idaho, which operates Idaho National Engineering Laboratory (INEL), reported marked improvement in coal biosolubility after metal ions were removed.

The INEL researchers determined that the metal ions in coal include iron, calcium, aluminium and magnesium. The researcher also found that the ions form insoluble complexes which increase the difficulty of liquefying coal, particularly in low-grade coal types.

The researchers believe that by removing the ions, the coal would become much more soluble in alkaline solutions. This factor is important, because it can reduce the sulfur content in coal by more than 50% and reduce ash content by up to 80%, alleviating some of coal's pollution problems.

The INEL programme focussed on microbial isolates from the air. 'Microorganisms have very well defined systems to act on metal ions in the environment', Quigley recently reported to the R & D editor.

For instance, iron 3 is not soluble at a neutral pH where microorganisms exist, but microbes can secrete Siderophors which accumulate around that ion and make it soluble. Another microorganism can secrete citrate to chelate another type of metal ion and so on.

Different organisms have different abilities to chelate metal ions. Some tend to be very specific and some are more general.

The microbe system INEL used had to be matched to the coal being treated. For example, coal from Gulf Coast of USA mostly contain iron ions, while those from the Plains states have less iron and more calcium.

Quigley and his researchers have been working with two methods for ion removal. One to use a dilute acid typically hydrochloric on crushed coal. The acid dissolves the ions which then are washed from the coal. Microbes are introduced to produce an alkaline material that causes solubilisation.

A second approach uses the organisms themselves to dissolve metal ion The microbe types Quigley reported ar the same for both methods. Those bein worked which include bacillus tramete and candida. In all, nine coal solubilising microorganisms were used in th tests. In removing the ions, the microbe raise the pH of coal slurries to permi solubilisation.

Results of tests run to date have been striking. Quigley said, 'In laboratory work we have demonstrated the ability to increase the solubility of coal into dilute alkali by 200 to 1000% and both methods work. A goal of air current work is to isolate that fraction of the microorganisms system which enhances the solubility of coal in alkaline solution and devise effective ways of extracting that from a microbial culture.

To carry the process a step further, the research group also is searching for an enzyme system that can effectively depolymerise coal to provide a liquid product. This could lead to a multistep system where microorganisms first would solubilise coal and then would be subjected to enzymatic attack. (*R & D*, March 1989, p.p. 20-22).

HIGH CHOLESTEROL LINKED TO GENE DEFECT

A mutation that results in the substitution of a single amino acid for another has been uncovered as a genetic basis for elevated levels of low density lipoproteins (LDL) cholesterol, which have been linked to heart disease.

About two-thirds of cholesterol in blood plasma is carried by LDL cholesterol, and is removed when the protein part of LDL binds to LDL receptors in lever and other cells. Previous research has shown that some individuals with high LDL cholesterol levels have genetic defects in the receptors.

Now, researchers at the cardiovascular Research Institute of the University f California have shown that a defect the gene that codes for the LDL itself lso results in the elevated LDL choles-erol levels.

Researchers studied subjects from everal families with members who had igh LDL, cholesterol levels and found hey shared a common mutation in the ene than codes for the carboxy termi-al half of the protein part of LDL. The nutation result in a substitution of glut-mine arginine in a region of the molecule associated with its binding to the eceptor. (Proc. Natl. Acad, *Sci*, 86, 587, 989).

NATURAL SEMI-CONDUCTOR SYNTHESISED BY YEAST

Natural crystallites of cadmium sulfide semi-conductor are synthesised by yeast cells in the presence of cadmium salts report researchers at the University of Utah, Medical Centre, Salt Lake City and others from At & T Bell Laboratories.

The clusters are a class of colloidal semi-conductor particles (1 to 100 nm across) whose properties are intermediate between those of isolated molecules and solids. When exposed to Cd ions, the yeast cells respond by synthesising chelating peptides and increasing sulfide production in an attempt to prevent Cd poisoning. The peptides control the nucleation and growth of Cd particles that form, yielding mono-disperse crystallites.

According to the researchers, these crystallites too small to have continuous energy bonds. The onset of such quantum properties sets a fundamental limit to device miniaturisation in microelectronics.

In another unusual synthetic route recently developed by Norman Herion (Du Pont) et al cadmium sulfide crystallites were formed in zeolites. (*Nature* 338, 596, (1989), *J Am. Chem Soc.*,111, 530, 1989).

BIOTECH KIT & EQUIPMENT PROSPECTS

A recent market survey has identified high growth potential and international development opportunities for bioprocessing equipment manufacturers. BASE International, which carried out the survey on behalf of the Association for Advancement of British Biotechnology predicts a 25% per annum increase in world sales potential for equipment for biotechnology. Compared with sales to existing bioprocess industries, this is expected to reach ¥1800 million by the end of the year 2000 AD. (*Mfg. Chemist*, 7/1989, p. 7).

AN IMPROVED CHEESE MATURATION PROCESS FOR CHEDDAR CHEESE DEVELOPED IN CANADA

Just outside Montreal is the new high-technology St-Hyacinthe Food Research Centre, Quebec, Canada. It is one of the best managed research centres in food technology in the world. This research centre has the most modern Biotechnology Department under Dr. Byong Lee. The department's most successful research project has been on the maturation of cheddar cheese. A cheddar cheese which once took months to age can now be naturally ripened in a matter of days.

The scientists modify the genetic material of the lactic bacteria, to increase enzyme production. They then use a cloning technique on the bacteria to increase its fermentation capacity. (This occurs when the enzyme activity in the lactic bacteria culture is increased). Lastly, the culture is incorporated into the soon-to-be ripened cheese. From there Dr. Lee indicates that there is a 60% reduction in the time needed for cheese ripening. The local industries in Canada are now using the method. Another biotech group is working with fermentation and is involved with some very interesting transformations of food waste. Whey, which causes pollution when simply discarded, can be modified with enzyme technology to make a marketable glucose syrup. (*Food Engg. Intl.*, 4/1989, p. 50).

NITTO CHEMICAL (JAPAN) UNVEILS ACRYLAMIDE MICROBE

Nitto Chemical Industry's (Japan) researchers have recently discovered a microbe, which they claim is capable of improving biological production of acrylamide. The microbe will allow the company to hike acrylamide production from 6,000 ton/yr to 10,000 ton/year without having to revamp its facilities.

According to Nitto, this microbial process for acrylamide is superior to the H_2SO_4 acid and copper catalyst processes now in use. It is capable of producing acrylamide at lower cost and calls for only limited space for installation of process units.

The new organism will be scaled up for commercial production in 1989. Nitto intends using the technology overseas both by itself and through joint venture. (*ECN.*, 7/24/89, p. 11).

BIOTECHNOLOGY CAN UNIFY AGRICULTURAL INPUTS

The application of biotechnology to farm production will provide a much-needed systems approach to agricultural inputs, says a leading agrobiotech scientist, Dr. R. Sandmerer of Sandoz Crop. Protection Corpn., San Francisco CA. His comments focussed on the unifying potential of using biotech techniques to help meet the needs of modern agriculture.

Up to now, noted Dr. Sandmerer, developments in agriculture have tended to occur singularly. 'If we look at single inputs only', he noted, 'we find we may be focussed on solving one problem that, in the process we inadventently create others'.

For example, even though the green revolution created new high-yielding varieties of wheat and rice, those yeilds are obtainable mainly by increasing the input of fertiliser and crop protection chemicals. In seeking to stop soil erosion and moisture loss caused by heavy use of innovative farm machinery, we settled on reduced tillage agriculture, which has created ideal environment for insect eggs, disease spores and tougher weeds.

The ability to engineer seed to insect resistance will eliminate the need to apply insecticides. 'This essentially contains the insecticide within the plant and only insects which chew on the plant will be exposed to the chemicals, he said. Another form of contaminant will occur when scientists develop herbicides and insecticides that affect only a specific class of pest, and not other wildlife that may be present. (*Biotech Prog.*, 3/1989, p. M5).

MONSANTO'S AGREEMENT WITH THE USSR ACADEMY OF SCIENCES FOR BIOTECH RESEARCH

Monsanto Co. (USA) and the USSR Academy of Sciences have signed an agreement to establish the first joint biotechnology laboratory which will be housed at the Shemyakin Institute in Moscow and will focus on pharmaceutical development and research on plant and animal growth factors.

The agreement calls for Monsanto to provide equipment scientific support and funding totalling $ 1.5 million over a 3 year period, while the laboratory will be staffed by 10 top Soviet life research scientists.

Prof. Vadim Ivanov, director of Shemyakin Institute and head of Biogen, which coordinates the Academy's life sciences research said, 'we are hopeful that new pharmaceutical an agricultural products will be discovere as a result of this collaboration'.

One key element of the agreement fo Monsanto is the development of genetic engineering research on diseas resistance in plants. Currently, the company sells both of its leading herbicides Lasso and Roundup to the Soviets. Th agreement comes several months afte 45 Soviet diplomats met in Paris and signed a 5-year agreement to encourage joint activities in eight fields of scientific research.

If new products are developed in the Shemyakin Laboratories by Soviet scientists, intellectual property rights could become a contentions issue.

The Soviet scientists would hold the discovery and patent rights, while Monsanto would have rights to joint commercialisation. (*Chem Engg. Prog.* 8/1989, p. 8).

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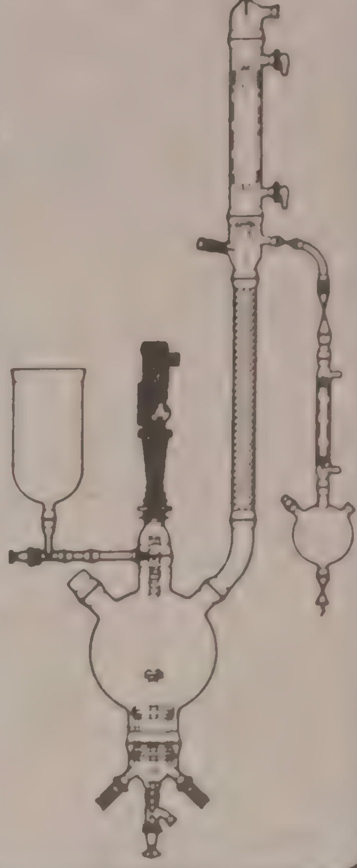

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Food and Pharmaceutical Technology in Perspective

NEW LIGHT ON MAILLARD REACTION (BROWNING REACTION)

The reaction of amino groups of amino acids, peptides or proteins with the 'glycosidic' hydroxyl groups of sugars ultimately resulting in the formation of brown pigments is a common reaction in food processing and is known as Maillard reaction. Its inhibition is of particular interest to food chemists.

The Maillard reaction between amino acids and reducing sugars often results in the brown crust on freshly baked bread or the brown surface of a grilled steak. But it is not so popular when it browns the content of a salad bar.

The Maillard reaction is inhibited by sulfite, but sulfite causes adverse reactions among a small fraction of the population. The search for a new inhibiting agent continues and has led towards better understanding on how the sulfite works as an inhibiting agent. J. Farman and co-workers have recently reported that sulfite works by irreversibly binding to pyrroles that are precursors to the brown pigments called melanoidins. (*J. Org. Chem.*,1988, 53, 2346).

A NEW TECHNIQUE TO PRESERVE FRUITS AND VEGETABLES WITHOUT FREEZING

Researcher Attila Pavlath of US Department of Agriculture (Albany, Calif, USA) has recently unveiled a technique to keep sliced fruits and vegetables fresh for up to three days by covering them with an edible coating based on milk.

Although farmers use coatings for preserving whole fruits and vegetables, until now no one has found, a way of preserving fruit and vegetables that have been cut or peeled. The problem researchers face is the development of a coating that will stick onto a moist surface and prevent oxygen passing in and water passing out.

Most fruits and vegetables give off carbon dioxide after they have been picked. Unless the coating enables the carbon dioxide to pass through it, the taste of the food will change. The coating also has to be edible and — perhaps the most difficult condition to meet acceptable to the US Food & Drug Administration.

Pavlath took milk as a starting point because the proteins in it make a very good film. Protein films form an inadequate barrier against water and oxygen, so Pavlath had to modify them by adding enzymes to the milk.

These enzymes 'tie' the proteins together. Pavlath used the technique to weave proteins together, so forming a mesh fine enough to reduce the amount of oxygen and water molecules crossing the barrier.

The films could also be used to modify produce and according to Pavlath, add 'exciting new flavours or colourings to standard fare. The possibility is to perk up sliced pears by protecting them with a protein coating flavoured with natural red cherries. The coating could also be used to keep fillings in pies and pizzas from soaking the crust.

Although the barrier keeps cut fruits for several days, food companies are unlikely to use this coating technique, unless it can preserve food for several weeks, because of the amount of time it takes to distribute food to supermarkets.

Further research is therefore necessary before the new technique can find wide scale application in the food processing industry. (*New Sci.*, 6/17/89, p. 44).

THE NATIONAL CENTRE FOR FOOD SAFETY & TECHNOLOGY MOOTED IN USA

FDA has joined forces with the Illinois Institute of Technology, the IIT Research Institute, to create the National Centre for Food Safety & Technology. The centre will be located at IIT's Moffett Technical Centre at Bedford Park, Illinois.

The rapidly changing field of food science is presenting the industry with an array of new production, processing and packaging techniques. At the national centre, the first to unite the resources of academia and government, FDA and industry will conduct research on aspetic processing, new packaging materials, computer controlled processing equipment, biotechnology and other innovations in the field. FDA has allocated $ 700000 for the centre's first year of operation. (*FDA Consumer*, Feb.1989 p. 5).

SOYFOOD PRODUCTION POISED FOR GROWTH IN USA

Soymilk sales in USA in 1988 were expected to reach 4.8 million gallons valued at $ 36.1 million, compared with 3.3 million gallons of sales valued at $ 25.6 million in 1987, according to Soya Newsletter.

The newsletter reports that US soymilk consumption has been bolstered by increased domestic production, lower prices and larger package sizes. Soymilks gaining in popularity are processed with high-tech systems that produce a non-beany flavoured product and are packaged in either retort pouches or aseptic Tetrapacks.

In addition, 62 million pounds of soybeans were used in 1988 in USA to make domestically produced soyfoods. In addition to soymilk, soyfoods produced included tofy, tempeh, soy sauce, miso and soynuts. This reflects great progress in soyfood technology in USA in recent years. (*JAOCS*, 2/1989, p. 182).

NATURAL RED PIGMENT CULTURED FROM APPLES

Takeda Chemical Industries (Japan) has reported the development of techniques for culturing the red pigments cells of the star king apple and for efficient mass production of a brilliant red pigment that cannot be produced by synthesis. The pigment could have use as a safe colouring for cosmetics and pharmaceticals.

The shoot apex of the star king apple sapling was cultured in an agar culture bed impregnated with plant hormone to produce the callus, and a red pigment cell containing genes which determine the fruit's colour was discovered. Red pigment cells were cultured for a week each over a period of two months and calluses that stably produced red pigment were selected.

The company ultimately developed a commercialisation outlook by (a) mass culturing of cells in a dark environment, (b) efficient production of pigment under a blue light and (c) efficient pigment extraction.

Red pigment calluses were placed in a liquid culture bed and rapidly grown by shaking liquid culturing while blowing in air in a dark environment without any light, by which colourless suspensoid cells were obtained. The placing of these cells under a blue fluorescent lamp caused the production of red pigment to peak in from 14 to 20 days. The output under a blue light is 2.9 times that under a red light.

Research is under way on how to set the culturing conditions to efficiently produce the pigment with a one litre tank, but the company plans to construct a test plant based on this two-stage process next year and engage in the manufacture of the pigment's sample. (*Mfg. Chemist*, 7/1989, p. 16).

GNFC DEVELOPS NEW REFRIGERATION APPARATUS

Gujarat Narmada Valley Fertilizers Co. Ltd., Bharuch, India has for the first time in the country developed a new apparatus for refrigeration by using liquid nitrogen, replacing the use of dry ice.

This apparatus is easy to handle and more economical in operation, can be effectively used to maintain the quality of food for longer duration. In recognition of this, the controller of Patents has granted patent to GNFC to make use, exercise, sell or distribute the apparatus.

For further information contact: Gujarat Narmada Valley Fertilisers Co. Ltd., P.O. Narmada-Nagar, Dist. Bharuch, Gujarat 392 015. India.

STEREOISOMERS SEPARATION TECHNOLOGY & DEVELOPMENT OF NEW DRUGS

Recent advances in technology that allows the separation of stereoisomers will have important implications for the development of new pharmaceuticals and possibly even new food products. Regulatory authorities are likely to ask for efficacy and safety data on the different enantiomers and companies may be asked to justify the choice for development of either a single enantiomer or a racemic mixture.

The enantiomers of the same compound may differ in their pharmacology, pharmacokinetics, metabolism and side-effects, suggesting there may be a therapeutic benefit in isolating optically active isomers. If one of the active enantiomer would allow half the racemate dose to be given, an inactive enantiomer which produces side-effects not found with the active enantiomer is unnecessarily reducing the risk/benefit ratio of the racemate.

Recent studies have suggested that the enantiomers of thalidomide differ in their biological activities and some researchers have concluded that its teretogenic effects are found in only one enantiomer, although this has not been proven. Similarly, enantiomers of benoxaprofen (Lilly's Opren) have different pharmacokinetic behaviours, leading to speculation that perhaps an optically pure enantiomer would not have had the problems experienced with the racemate. (*Scripp*, 5/19/89, p. 28).

LACTOSE & D-MANNOSE CAN KEEP SALMONELLA AT BAY IN POULTRY

Poultry farmers could effectively eradicate salmonella infection in poultry by adding sugars (lactose and D-mannose) to their drinking water.

Researcher John DeLoach (of the US Dept. of Agriculture, College Station, Texas), dramatically reduced the number of Salmonella typhimurium bacteria in infected chickens by adding lactose and D-mannose to their drinking water. DeLoach found that at 10-days old only 53% of the birds which drank water containing lactose and only 26% of the birds which drink water containing D-mannose had any Salmonella bacteria. Initially all the birds were infected with Salmonella. More significantly, the researcher found that the birds treated with D-mannose and lactose had 99.9% fewer salmonella bacteria than a control group of birds which drank ordinary water.

DeLoach speculates that both sugars mannose and lactose, act by modifying the environment within the chicks intestines probably because other species of bacteria, non-pathogens, ferment the sugars. The fermentation changes the pH in the gut, making it less conducive to the growth of salmonella. However, DeLoach does not yet know the precise mechanism. The researcher stumbled on these findings by reviewing the earlier scientific literature on the subject.

If the above sugar treatment proves effective, it could provide a very cheap way for controlling salmonella infection in poultry.

People can get salmonella food poisoning by eating chicken that has not been cooked properly. The symptoms include nausea, diarrhoea and vomiting.

DeLoach reports an enthusiastic response from the poultry industry. The US National Broiler Council, the latest poultry industry group is interested in co-sponsoring a large scale field trial of lactose (the cheapest sugar as compared to D-mannose).

The cost of adding lactose to the drinking water of birds may be no more than two cents per bird over its life-time. The turkey industry also plans to start a large scale field trial on the effect of adding non-fat dry milk to feed. (*New Sci.*, 6/17/89, p. 43).

SUPERCRITICAL CARBON DIOXIDE GAINING GROUND IN COMMERCIAL EXTRACTION OF FLAVOURS

The first commercial exploitation of super critical carbon dioxide in flavour extraction was in hopes, by Pfizer Chemical Products in Sidney, Nebraska, USA. The company is also running several pilot plant units in Milwaukee, Wisconsin.

Recently, CAL-Pfizer Flavour & Fragrance Product Group has opened a CO_2 process flavour extraction unit in Grasse, France. Grasse, incidentally is the perfumery centre of France famous for its natural flower extracts. The plant which cost $ 3 million, uses CO_2 in a 'supercritical state' to extract flavours from spices, flowers and other botanicals without the use of solvents that leave residues.

CAL-Pfizer, formerly, Camilli Albert & Latour, introduced sample oils from this process at the World Perfumery Conference of February 1988, as did Felton Worldwide Inc., which has also invested in supercritical CO_2 technology.

The market that is first on both the above companies' lists for penetration is that of vanilla extract, where a large price differential exists between current natural and synthetic extract alternatives. (*CMR*, 6/26/89, p. 4).

A NEW PLACENTAL DRUG ON CLINICAL TRIALS IN THE USSR

The Soviet authorities have granted a team of Georgian researchers the equivalent of a patent for a substance extracted from human placenta. The new product is called plaferon and is said to be an analogue of the group proteins called interferons (interferons are produced by cells when a virus infects the cells, they inhibit cell growth).

According to Zarya Vostoka, a daily newspaper in Thilisii the capital of Georgia, doctors have carried out several clinical trials of Plaferon. These had promising results in treating disorders of the heart, nerves, eyes and urinary system. Trials of Plaferon for the treatment of viral hepatitis, were particularly favourable, the report said. (*New Sci.*, 7/15/89, p. 25).

CALGENE OBTAINS PATENT FOR IMPROVED RIPE TOMATOES

Calgene Inc. (Davis, California) has recently obtained a US patent to protect proprietary tomato plants engineered to produce fruit with a substantially extended shelf-life. The patent is th first to be issued convering the use c antisense technology in geneticall engineered plants.

The company had successfully use antisense recombinant DNA technolog to reduce the presence of a normall present tomato enzyme called polygalactoronase (PG), which is involved i softening ripe tomato fruit.

The antisense PG tomato was developed in work funded in partnership wit Campbell Soup Company, which own worldwide tomato plant rights and i Calgene's commercialisation partner fo biotechnology developed tomato products.

Calgene has filed patent application in the USA, Europe, and elsewhere which are directed at protecting its broad rights to the use of antisense technology in plants.

The patent specifically protects the use of the tomato PG DNA sequence including the antisense orientation of the gene and tomato cells expressing such sequences. It protects a gene which could have a dramatic effect on the $ 4 billion per year US fresh tomato market.

According to Dr. Robert Goodman, Calgene's executive vice president for R & D, tomatoes engineered with the antisense polygalacturonase gene appear to ripen normally on the vine, but softening of the ripe fruit is significantly delayed.

He said such tomatoes could benefit consumers in the fresh tomato market by eliminating the need for common fractures that destroy the fruits flavour, such as harvesting when green, ethylene gas treatment and refrigeration during transportation. Also processors could benefit through more selective harvesting and improved inventory management, resulting in reduced overal processing costs. (*Food Technol* 4/1989, p. 73).

ELECTRON BEAM ACCELERATOR EMPLOYED TO PASTEURISE POULTRY MEAT

Electrons travelling at high speeds will rip through the cells walls of bacteria, killing or at the least disrupting the cell. On the way, the electrons will not damage meat cells, leaving the taste and structure unchanged.

It was this inherent property of electrons that prompted SPI (Societe de Proteins Industrierelles), a subsidiary of the French supermarket group Guyomare'h, to install an electron beam accelerator to pasteurise blocks of frozen poultry meats. The plant located in Brittany, has been using the accelerator since 1987 with both success and safety.

SPI collects the meats, presses it into slabs, freezes the meat into 10 kg blocks in polyethylene bags (measuring 53 cm x 35 cm x 5.5 cm) and pasteurizes the blocks beneath the electron accelerator.

After freezing, they are conveyed into the ionization room, which is a made of thick concrete walls which prevent errant elctrons from escaping. The blocks pass within the electron stream which gives a 3K Gy dose, although the dosage can be set as high as 5K Gy.

Next, the blocks are turned inside down and passed once more beneath the electron accelerator. Both sides are treated to ensure proper distinction of Salmonella.

The entire process takes 10 mins and the system can treat 50 tons in 14 hours. Only one man is required to operate the system, but as a precaution, SPI staffs, the ionization room with two. Power consumption is not at all outlandish. The system at SPI only uses 110 KVA.

The total cost for electrical consumption, power and maintenance was one of the driving forces behind the technology. Electron beam is low in cost compared to heat treatment. 0.1 Ffr per kilogram of meat.

The lipids in the poultry meat remain stable since no heat treatment is involved. Similarly, the vitamin and flavour profile of the meat remains unchanged. Since there is no heat, the proteins do not denature. And, the textukre and organoleptic quality of the meat is identical before and after pasteruisation. (*Food Engg. Intl.*, 3/1989, pp 38-39).

BETTER TOMATOES ALMOST NATURALLY VIA ORGANIC AMINE TREATMENT

Cornell University (Ithaca, N.Y.) has applied for a patent on a chemical process that extends the 4 to 5 day shelf-life of vine ripened tomatoes to 10 to 12 days.

Currently, most tomatoes sold during the 'off-season' are picked when they are still green and that diminishes their flavour. They are then treated with ethylene to bring about ripening.

As an alternative, processors could wait for the fruit to start turning red on the plant and then slow ripening by increasing the tomatoes' natural concentration of polyamines, reports project director Peter Davies, a professor of plant physiology in the College of Agriculture and Life Sciences. One such amine is 1,4-butanediamine and Davies notes, the amino acid methionine works as well.

In Davies' process the picked tomato is placed in an air-tight container of the chemical solution. When the vacuum is released, the solution is drawn into the fruit. Davies says only about 1 mg. of these inexpensive chemicals is needed for each tomato.

Davies and co-workers ran across 1,4-butanediamine when they determined the chemical basis for the long shelf-life of a Brazilian tomato called Alcobaca. A renowned commercial company — presumably Campbel Soup — is evaluating the techniques. (*Chem Wk.*, 5/17/89, p. 24).

NEW LANDMARKS IN FOOD RESEARCH IDENTIFIED FOR THE FUTURE

On the 80th Anniversary of the ACS Agricultural & Food Chemistry Division, the leading food researchers identified the following six landmarks in food and agricultural research for the coming years.

* The microwave oven is getting the limelight in USA and W. Europe and the convenience food industry is responding with new flavours, antioxidants, preservatives and of course, new packaging.

* Low-level radiation to prolong shelf-life without refrigeration has begun in earnest.

* People have become more health conscious in advanced countries and have been eating less meat (mutton and beef) and more fish, so meat industry is looking to breed leaner meat.

* US Department of Agriculture is working on both biodegradable plastics from surplus corn starch and conversion of wheat straw into animal feed.

* Chitin and chitosan, derived from seafood processing, shell waste, are used commercially for sutures, burn dressings, metal chelation and waste-water flocculation.

* Biotechnology promises to lead to nitrogen fixation by non-legume crops; environmentally, friendly pest control and crop-growth regulation; improved utilization of lignin, cellulose and chitin; and development of aquaculture. (*J Ag. Food Chem 1988*, 36 (5), 875, *Chemtech*, 3/1989, p. 190).

Science Briefs

LOGICAL CONTROL OF STS PAYS

Scientists at Central Biological Con- Station at Hyderabad have obtained d results in the control of weeds and ts affecting major crops such as dy, pulses and cotton, through bio- ical means.

Mrs. Meena Gupta, Station Assistant ector, said that the station had mass duced and released millions of bio- nts-predators, pathogens and phyt- nages insects, over hundreds of acres fields to control insect pests and eds by their own natural enemies.

She said that egg, larval and pupal asites and predators are mostly eased as natural enemies against jor pests of paddy, sorghum, castor, lses, cotton and vegetables.

"Satisfactory control of some pests" s achieved, she added.

She said 30 to 40% of rice stem borer s controlled by egg parasite, tricho- mma japonicum and T-chilonis at ongir, Warangal, Pedagolkonda, iznagar, Ramachandrapuram, Med- al and Mylardevalpally. Rice stem rer is a serious pest and prevalent in st rice growing areas. Similarly, 20% ntrol of sorghum stem borer was hieved.

Dr. Gupta said that good results were o achieved in controlling the polyph- ous American bolloworm — heliothis nigera — which affects cotton, lses, tomato and other crops. About to 25% control was achieved in nato crops. This has resulted not only ncreased yield but the quality of fruit s also better, she added.

She said apart from releasing paras- s and predators, spraying of nuclear yhedrosis virus (NPV) against nigera in cotton fields at Mutpur, Narsayapally and Ongole had given 20-40% control. "This station is proposing to cover large cotton areas with this NPV during the coming season", she added.

As regards weed control by the phytophagous insects, Dr. Gupta said, about 80% of the water hyacinth weed at Nacharam tank near Hyderabad, was brought under control by releasing the weevil neochetina eighhorniae, this weevil was also released in Kollery lake in Krishna district and the weevil had spread in the entire lake area indicating successful colonisation.

Dr. Gupta said, biological control method was safe, economical and self-perpetuating and, therefore, the natural enemies should be conserved and encouraged for better crop protection and production.

She said efforts of scientists had resulted in increased awareness among farmers. There was good demand for taking up more control programmes in their fields. The farmers also realised that by regular conservation and augmentation of these natural enemies, the yields could be increased.

Rs. 56 CRORE FOR BIOTECH RESEARCH IN 8TH PLAN

The allocation for biotechnology research has been increased from Rs. eight crores in 1985 to nearly Rs. 56 crores by the Union Government in the current year.

President of the Association of Food Scientists and Technologists (India), Dr. L.V. Venkataraman, said recently, that India had already been recognised as the leader in the third world in biotechnology research. A major breakthrough had already been achieved in developing various vaccines and diagnostic kits in India. The next breakthrough would be in increasing yield from oil seeds and in getting viable quantities of oil from sources like rice bran. "We expect the allocation to be substantially more in the Eighth Five-Year-Plan, with some sixty laboratories and research institutions involved in major innovations", he added.

BACTERIA REMOVE SILICA IMPURITIES FROM MAGNESIUM ORES

A team of microbiologists from Bose Institute, Calcutta, have reported the isolation of a class of bacteria that can remove impurities from magnesium ores and make the processing of this mineral several times cheaper.

The researchers said the bacteria discovered in the magnesite ore reserves in Salem, Tamil Nadu, can expel silica impurities from magnesium which obstruct the use of this element as a refractory.

Nearly one-fourth of the magnesite reserves in India contain an average of four per cent silica and ores with more than one per cent silica are rejected by the refractory industries, said team member B. Mohanty.

Various chemical methods used to remove silica from the magnesium ore have been found unsuitable due to their high cost as well as the trouble some procedures involved, the researchers said in their paper presented at the 76th session of the Indian Science Congress held in Madurai recently.

Laboratory scale tests show that the bacteria can reduce the silica content to less than one per cent through special treatment, Mohanty said. There are indications that the bacteria-aided process will be nearly 100 times cheaper than chemical processes, he said.

The studies have shown that the release of silica is enhanced when the magnesite ore is pretreated with either hydrochloric or sulphuric acid.

The effect is greater with sulphuric acid, the scientists said in their report. The bacteria belong to the genus Baccilus but the species has still not been identified, Mohanty said. The mechanism that the bacteria uses to get rid of the silica also has to be studied, he said. Other Bose Institute team members were A.K. Mishra and Suparna Ghosh (GSM).

— PTI Science Service

HIGH-QUALITY, INEXPENSIVE NON-FIRED CERAMICS

A Japanese company has developed a new material, Thomas ceramics, which hardens through a chemical process, rather than by firing.

It is produced by adding a special chemical to its main components (zirconium, titanium, alumina, calcium, magnesium, limestone and special clay montmorillonite). This chemical generates heat when it comes in contact with water to harden the ceramics. By creating a mix of Thomas ceramic (30%) and industrial waste or mud (70%) and putting the mixture into a mold, high-strength tiles and structural parts can be easily produced. And because the production process is simple and requires virtually no energy expense. Thomas-ceramics tiles cost only about one-third the price of conventional tiles. When fired, the hardness of Thomas-ceramics tiles is increased.

ARTIFICIAL NOSE FOR EXPLOSIVE AND NOXIOUS GASES

A microelectronic chemical sensor which can detect several kinds of hazardous gases, even when they are mixed together, has been developed by researchers at Sandia National Laboratories, New Mexico, USA.

The sensor, informally called an "artificial nose", is very small and rugged, and the researchers suggest it could be produced relatively cheaply, reports the journal "The Chemical Engineer".

A typical sensor might consist of six tiny diodes etched on a silicon wafer. Over each diode is deposited a thin layer, may be .0002 mm, of catalytic material consisting of different combinations of palladium and a second metal, which typically might be gold or silver.

The sensor detects hydrogen and any gas which readily decomposes into hydrogen plus other chemicals. Gases lower the resistivity of the catalyst-covered diode, causing current to flow. Hydrogen-containing gases cause the device to draw larger currents. By monitoring the current and measuring the amount and time history of the change, it is possible to work out what gases are being detected and in what quantities.

Varying the combination of palladium and the second metal layer enables the gas-detecting characteristics of a diode to be adjusted for greater sensitivity to specific gases. Gases can be detected at concentrations of a few parts per million.

At room temperature the sensor detects the isotopes of hydrogen, deuterium and tritium, as well as hydrogen itself. It can also detect gases containing hydrogen, such as hydrogen sulphide and formic acid. Tailoring can make it sensitive to some gases that do not contain hydrogen, such as nitrogen dioxide, if they are in a gas flow with hydrogen. At higher temperatures —100 to 200° C — it responds more swiftly and gets a significant response from gases such as ethylene and propylene which produce little response at room temperature.

In size, a sensor could be as small as a pencil rubber. Drawing a very small current, a few nanoamperes, it could run on a small watch or camera battery for years.

The original use proposed for the "artificial nose" was in monitoring health and safety at US nuclear weapons stockpiles where it would detect g that could indicate possible metal rosion or gas leaks.

Robert Hughes, the prime develo of the device, believes there are br industrial applications. He points to petrochemical industry with its m hydrogen-bearing chemicals. An "a ificial nose" at strategic points wo indicate the accumulation of noxious explosive gases.

An interesting application has be suggested by a doctor specialising geriatric medicine. It is fairly comm for old people to lose their sense smell. This can be dangerous if th smell smoke, meat which is "off", the chemicals added to natural gas make it smell. Mr. Hughes thinks should be possible to develop advanced model to detect these smel

— PTI Science Servi

PHEROMONES ADD A NEW TWIST TO COTTON CROPS

Farmers in Pakistan have just co pleted trials of a plastic twist-tie to pr tect cotton against the cotton bollwor The twist-ties are similar to those us for fastening rubbish bags but conta the chemicals that insects release affect the behaviour of other insec These chemicals, known as pher mones, gradually seep out of the twi ties, evaporate into the air and stop t pests from mating, reports the jour "New Scientist".

Many pests, male moths for exa ple, find their mates by scent. Ju before mating, the female moths relea sex hormones to tell the males whe they are. But too much hormone in t air makes it impossible to locate t females, and they cannot mate.

The farmers claim that the success the trials confirms that biological co trol is effective, and that it also mak good economic sense. The farme found that cotton treated with the pher ne required two to three fewer sprays insecticide than cotton which was not ated, during the course of the three-nth growing season.

Researchers have already discovered at pheromones are effective against e pink bollworm, the most common tton pest in the world. However, the eromones have only been available as iquid sprayed from knapsacks or from e aircraft. Farmers must apply sprays ery two weeks or so.

The twist-tie, pioneered by Shin-Etsu hemical Company in Tokyo, has two rands. One contains the pheromone, e other holds wire that allows it to be stened to a cotton stem.

The pheromones are safe to use and armless to living organisms. Insectide poisoning, which can be fatal to nimals, is common in the developing orld. Moreover, insecticides kill not nly the target pest but also beneficial sects that keep other potential pests at ay. Whitefly and mites often take over s new cotton pests once insecticides ave destroyed their predators along ith the original pests.

In Pakistan, the trials took place with e assistance of researchers from the ritish Overseas Development Admintration (BODA). BODA researchers ollaborated with a British firm, Biologal Control Systems, to design another pe of pheromone formulation which as proved to be as effective as the Japnese product.

The British formulation is black polmer strip in which the pheromones are corporated into the polymer before it extruded. The farmer ties the strip round the base of the cotton plant efore the pest establishes itself.

The company has since developed a roduct that disrupts the mating of a ajor pest called the rice-stem borer. armers place pieces of black polymer, cm square and 1 mm thick, at the top of split canes which they then place in paddy fields.

Recent trials of the product in Spain showed that the squares emitted the pheromone of the rice-stem borer for more than 100 days, and that damage by the borer was comparable to that in fields treated with insecticides.

One problem with using this type of pest control in tropical countries is that ultra-violet light from the Sun can inactivate the pheromone. Many insect pheromones can exist as isomers, only one form of which is active. Ultra-violet light can induce a molecule to "flip" between its two isomeric forms.

Some agrochemical companies are also reluctant to take up biological control because the products that the method requires are usually highly selective.

— **PTI Science Service**

NEW METHOD OFFERS ALMOST UNNOTICEABLE GAS FLARING

A new method of burning off unwanted gas from process plants is claimed to be the most advanced in the world with almost unnoticeable flaring.

Groundflare, as it is known, is the result of development work at the British Petroleum (BP) Research Centre at Sunbury, near London, and several years testing at BP plants in the UK and continental Europe, reports the London Press Service.

The idea has now been taken to the commercial marketing stage by Kaldair, part of the BP group, whose flare division business manager, Mr. Terry Whiting commented: After extensive trials we know that we have the flare with the quietest and cleanest flame.

"It is also the flare with the least environmental impact and operationally the most advanced in the world. And it is suitable for all areas of the globe, land-based or shipboard."

The production of any oilfield requires flares either to dispose of gas continuously or as a safety valve. But burning-off was noisy and dirty, with clouds of black smoke and an incessant roar, until production began to shift from traditionally remote sites.

Attempts at producing environmentally-acceptable ground flares met with little success — until Kaldair, marketer of the famous Coanda principle flares like Indair and Mardair, took a hand.

The success of the trials with groundflare has resulted in it being chosen for the Wytch Farm onshore oilfield extension project, one of the most environmentally sensitive in Britain.

Mr. Steve Allum, senior engineer of Kaldair's Flare Division and a former member of the BP Research Centre's Special Projects Group, where much of the flare technology originated, explained the principles behind the breakthrough: "The Kaldair Groundflare's fin-plate burner is a multiple array of small nozzles which spread the gas on to a plate creating a film of flame. The low pressure operation is quiet and, owing to the rapid mixing of fuel and air, smokeless.

"Also the aerofoil design of the manifolds greatly reduces heat, so maintenance due to coking is avoided. No added steam or compressed air or staging is needed for its operation."

Extensive wind-tunnel tests have led to a unique slatted wind fence for an air intake, preventing turbulence and contributing to the efficiency of the burner. A relatively small combustion chamber which completely isolates the flame is clad with ceramic fibre refractory lining. This is simple to apply, robust and easy to maintain.

The groundflares are flexible. They

can range from the very small, disposing of a tonne of gas an hour, to the very big, with a throughput of 50 tonnes an hour. As an example, the installation at Wytch Farm has three enclosures, each 25 m long, 12 m high and 5m wide, and handling 32 tonnes of gas an hour. Even close to, the only sign of combustion is a glow through the wind fence at night.

— PTI Science Service

EARLY WARNING SYSTEM FOR OIL RIGS

A computer-based early warning system for detecting faults in oil rig machinery, developed by a company in Scotland, is the first of its kind in the world. The system, called Violet, has been devised by a software firm, Intelligent Applications, and is about to be installed on five platforms operated by British Petroleum (BP) in the North Sea, reports the London Press Service.

Violet works by continually drawing together data from sensors attached to the machinery and predicting, by monitoring vibration, whether faults are developing. Vibration monitoring is not in itself new, but the checking of a machine's health in this way has until now taken many man-hours and has been limited by the small number of people who are expert at analysing a particular machine's frequency spectrum.

Violet overcomes this by using artificial intelligence techniques to store the expertise of maintenance engineers and automate the interpretation of data. The main benefit of the new system is that of safety. Any trend or signal detected by the sensors which may point to a fault will be identified immediately and steps can be taken to deal with the problem. By detecting faults at the earliest possible stage, and especially before the machine breaks down Violet can also save operators potentially vast expense. On the BP platforms, the system will be used to monitor every critical piece of machinery, including pumps and compressors. For the future, Intelligent Applications foresees Violet being using in many other fields, including the steel, paper, and aviation industries.

— PTI Science Service

HEPATITIS B VACCINE PRODUCED THROUGH GENETIC ENGINEERING

Prof. Pierre Tiollais from Pasteur Institut of Paris has recently developed a hepatitis B vaccine by employing genetic engineering techniques. Expected to hit the French market soon, it will be the first vaccine meant for use in human beings obtained through biotechnology, as well as the first produced from recombinant mammal cells.

Viral hepatitis B vaccine is possibly the first and best example of what genetic engineering techniques can offer in the field of medicine. Hepatitis B, which is a serious global threat to public health (200 million people throughout the world are estimated to be affected by the virus), is suspected to be the cause of various primary liver cancers observed in certain regions of the world (especially Central Africa, South-east Asia and China), a report by CEDUST says.

Moreover, numerous epidemiological researchers enabled to demonstrate that the modes of transmission of hepatitis B virus are the same (blood and sperms) as those of AIDS. From this came the name "serum hepatitis", and hepatitis B was called so, even till a few years ago. However, the infectiousness of hepatitis B virus seems to be much lower than that of AIDS.

Thanks to the works of Prof. Philippe Maupas, 12 years ago, France became the first country to possess a safe and effective vaccine against hepatitis B. This vaccine consisted of viral particles purified from the blood of patients who contracted the virus but apparently showed no pathological sign of it (healthy carrier). Following the studies conducted in France as well as in Sene by the team of Prof. Maupas, Past Institute in 1981 started to manufact this vaccine industrially.

The development of genetic engi ering techniques, on the one hand, a the theoretical risks of infection wit vaccine prepared from human blood the other (for a few weeks in 1983 it w feared that the hepatitis B vaccine contaminated through AIDS virus, the necessary raw materials came fro Americans of high-risk groups), pave way for the quick marketing of so calle "second generation" vaccines, pr duced by genetic engineering.

The American multinational Merc Sharp and Dohme and the Belgia company RIT (subsidiary of the mult national Smith Kline and French) thu became the first to manufacture such vaccine from recombinant yeast cell It synthesises the viral fraction, which purified, is used as vaccine.

The French researchers under the lea dership of Prof. Pierre Tiollais (one o the international pioneers of research ers in this field) had, in their part adopted another strategy. Their targe was to produce a slightly different vira fraction (with more vaccinating power from recombinant mammal cells (cell from ovaries of Chinese hamsters).

No vaccine of this kind for use in human beings exists in the market. This vaccine, for the first time experimented on human beings in 1986, is now undergoing final studies at European level. Very soon, it will be marketed in France, replacing the first one. It is likely that in the beginning its price will be nearly the same as that of the present vaccine. A reduction in sales price (one of the main arguments with the manufacturers of products obtained through biotechnology) will be considered later, only after the necessary investments for the development of this technique produce a profit.

— PTI Science Service

Electrochemical tool for pollution control in metal finishing industries — Recent developments

Dr. R. VIJAYAVALLI
Central Electrochemical Research Institute, Karaikudi 623 006.

Introduction

The problem of pollution in metal finishing industries and its control are of great significance because of the magnitude as well as character of the effluent. From this industry the pollutants that may be emitted into the environment occur in all the three forms namely gaseous, solid as well as liquid. There are several ways of tackling gaseous pollution which do not involve any electrochemistry. Treatment of solid wastes has now been gaining importance slowly. So far the problem of pollution due to liquid effluents has been considered very serious and continuous attempts have been made to solve this problem satisfactorily.

The nature and composition of the effluent vary very widely depending on the various parameters characteristic of the particular industry under consideration. Contract platers with highly variable production face with the problem of multiple pollutants of variable composition. The most commonly occuring pollutants in these effluents are cyanides, chromic acid, chromates, toxic metal ions like Cu, Ni, Zn, Cd, Sn, Pb and various complexing agents. Several chemical and physico-chemical methods have been in practice for treatment of these effluents. Certain problems like increase in total dissolved solids and high sludge content (1), impedence of metal precipitation by metal complexes and chelates (2), have been experienced in these methods. Further, often the removal of the pollutant is also not complete and storage of toxic effluents also present a problem, since most of these operations are carried out in batches.

In view of the very stringent regulations for pollution control the effluent quality has to be maintained strictly within the specified limits. Hence there has been a demand for a need based research for better and more efficient methods of treatment. One such attempt has led to the development of methods based on the known electrochemical principles such as anodic oxidation, cathodic reduction, cathodic deposition, discharge of oxygen and hydrogen at the electrodes and also transport of ions under an electrolytic field. J.O'M. Bockris (3) has presented a summary of the various electrochemical techniques for effluent treatment. These are classified in two categories, one involving the physical removal of the pollutant and the other through electrochemical reactions involving the ionic pollutants (4). In the case of treatment of effluents from metal finishing industries, the latter group of methods find applications since most of the pollutants are in the ionic form and electrooxidation, electro reduction, deposition and electrodialysis are often used. The process of electrooxidation for destruction of cyanides were first reported independently by E. Ekern (5) and G.H. Clevenger (6).

Considerable research has been carried out in the following years but the full significance of contribution by electrochemistry as a tool for pollution control was realised in the early 80's. Recent developments in this field are presented in this paper. The subject can be divided broadly into three parts, namely treatment of cyanide bearing effluents, treatment of hexavalent chromium bearing effluents and treatment of effluents containing metal ions.

Treatment of cyanide effluents

The electrochemical treatment of cyanide can be carried out either by direct oxidation or by indirect oxidation through hypochlorite generated in situ (3). Earlier investigation on the oxidative destruction of cyanides have been relating to both direct and indirect oxidation processes. During electrolysis of a cyanide oxidation, cyanide containing solution from noble metal plating after removal of noble metals at a current density of 3.0 to 3.5 A/dm^2 at a voltage of 16V, practically all the cyanide was completely oxidised and carbon was deposited on the anode (7).

Bek et. al. have reported that presence of chloride and increase in current density accelerated the destruction of cyanides at a porous anode (8). Various anode materials have been tried in the oxidation of cyanide and anodes of graphite, RuO_2, Pt, Ir, Ti and Ta (9, 10) Pb (11), PbO_2 on Ti (12) and stainless steel (13) have been successfully tried in the reaction. Flow through porous electrodes of RuOx-Ti-Co-Ox-Ti and fibrous graphite electrodes were found to increase the rate of oxidation significantly (14). A batch reactor consisting of an anode made of graphite electrodes, graphite spheres and glass beads resulted in 100% removal of cyanides very fast (15). The efficiency of electrochemical reactions is highly dependent on the effective surface areas of the electrodes. Various electrochemical reactors such as flowing system (16) graphite in a porous barrel system (17) fluidised bed electrode system (18, 19) have been successfully tried in the process.

V. Ruml has shown that the rotating bipolar disc electrolysers could result in complete destruction of cyanides at

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* Paper presented at the seminar on Pollution and its Control in Metallurgical and Metal Finishing Industries on August 11-12, 1989, at AIEMA Technology Centre, Madras 58.

approx. 10.1 kwh/kg. CN^- (20, 21). Ghaout and Janson have standardised a trickle tower reactor for the destruction of cyanide (22) and they have reported that Cu, Ni and Cd accelerated the reaction (23). By the use of electrodialysis more effective oxidation could be brought about (24) and even concentrated solution obtained from the dialyser could be reused in the process (25).

Electrodialysis coupled with electrooxidation has been reported to decrease the power consumption (26). Packed bed reactors have been tried for the anodic oxidation successfully (27). Packed bed electrolysers comprising of graphite particulate bed were investigated and the reactors of flow by configuration were more efficient than those of flow through configuration (28-31). Presence of chloride during oxidation of complex cyanides accelerated the reaction (32). In the electrochemical decomposition of CuCN solutions, containing 1200 ppm cyanide, in an electrolytic cell consisting of a pair of stainless steel wire mesh electrodes, the cyanide concentration could be brought down to < 50 ppm with simultaneously recoveery of copper as metal at the cathode and CuO at the anode. The recovery of copper was > 90% and the power consumption was 14-34 kwh/kg CN^- (33). The influence of various metal ions on the oxidation of cyanides has been investigated extensively by Yogimara et. al. (34-38). Copper and nickel were found to accelerate the oxidation whereas Ag and Zn had no appreciable effects (39). In an improved electrochemical cell 94-99% conversion of cyanide and 85% for the thiocyanide has been reported in an investigation on the treatment of cuprocyanide (40) and the reactions involved have been through the first stage of decomposition of cuprocyanide to give free cyanide which then was further decomposed (41). In a cell with PbO_2 anode and steel cathodes with a porcelain or ion exchanger diaphragm the power consumption for the oxidation of simple cyanides has been reported as 3-5 kwh/kg KCN (42). A 50% reduction in energy requirement has been reported in a flow through electrolyser while treating a high cyanide effluent (43).

The power requirement has been 5-10 kwh/kg CN^- for the oxidation of cyanide in an electrolyte containing 0.15 M Na_2SO_4 as supporting electrolyte and Cu as catalyst (44). Sankar Gupta (45) reported a reactor design containing two reactions connected in such a way that part of the wastewater passes through the anode compartment of one reactor and then passes through the cathode chamber of the other while the rest passes through the cathode of the first and then through the anode chamber of the second and the reduction in cyanide concentration within 0.1 to 0.2 ppm while treating effluents from different plating operations.

Treatment of hexavalent chromium containing effluents

It is well known that the treatment of effluents containing chromates, chromic acid etc, involves first the reduction of Cr^{6+} to Cr^{3+} followed by precipitation as $Cr(OH)_3$ considerable work has been reported in literature regarding electrochemical reduction of Cr(VI) to Cr(III) (3,46). Ibl (47) reported successful conversion using $FeSO_4$ in the electrolyte in a diaphragm cell. Use of sacrifical anodes as well as insoluble anodes have been tried successfully (48, 49). In the former the main advantages is supply of Fe^{++} ions by anodic dissolution which act as coagulant. Carbon steel anodes have also been used for generation of Fe^{++} ions (50, 51) and the treatment can be either batch wise or continuous (50). Because of very low concentrations of these ions in solutions a simple two dimensional electrode system would not bring about very satisfactory results for application on commercial basis.

Hever and Novack (51) reported very high conversion efficiencies with a fluidised bed electrolyser consisting of graphite particles with a surface area of about 0.1 m^2/gm. Packed bed electrolysers have been found to result in 100% conversion of Cr(VI) and Cr(III) (52, 53). Treatment of chromic acid etching solutions by electrolysis with simultaneous recovery of copper on the cathode has been described by Heger et. al. (54). The effect of various anions and cations on the reduction reaction have been extensively investigated. Phosphates and chlorides adversely affect the reduction reaction whereas sulphates do not have any influence (55, 56). Zinc was found to get co-deposited on the cathode (57) and copper was also having a suppressing effect (58) on the reduction of Cr(VI) to Cr(III). Recovery of chromic acid and the metal ion from the effluents from the etching plants have been tried by electrolysis with a membrane in between the compartments (59). Electro reduction of Cr(VI) being a cathodic phenomenon it can well be expected that the metal ions present in the solution will also affect the process of reduction.

Treatment of effluents containing heavy metal ions

In view of the strong effects of the heavy metal pollution, considerable importance has been given for effective removal of these ions from the effluents. The current practice has been precipitation of heavy metal hydroxides and separation of the same by coagulation and filtration. In recent years development of various electrochemical methods have been under consideration for the removal of metal ions. A review on the various technologies available for recovery of Ni, Cu, Cr and Zn from plating effluents was made by Olthoff (60). Electrolytic precipitation of metals by having two dissimilar electrodes has been reported by Ichirai and the supernatent liquid after removing the precipitates was found to contain Ni^{2+} 0.01 ppm, Zn 0.03 and Cd 0.1 ppm (61). Use of sea water as anolyte for the removal of metal ions and simultaneous removal of cyanides have been reported to be successful (62, 63). Soluble anodes like mildsteel scrap (64, 65) have been found to result in compete removal of the heavy metal ions.

Since the conditions involved are those of very dilute solutions electrodes with high surface area are very much favoured. Porous graphite or carbon felt flow through electrodes have been able to reduce the metal concentration down to 0.1 ppm (66, 67). Reticulated vitreous carbon electrodes (RVC) provided a series of extended surface area electrodes for effluent treatment (68). The flow electrolysis at RVC enabled continuous clean up of Cu(II), Ag(I) and Pb(II) under controlled potential conditions (69). Conversion efficiencies of 64% have been reported for Cu, Cd, Cr, Pb, V and Zn removal from a simulated industrial waste water (70).

Electrocoagulation has been tried successfully for removing Zn, Pb and Cd from the plating waste waters (71, 72). Poon et. al. (73, 74) reported that electrofloatation of heavy metal hydroxide could also be used to remove the metal ions. Turbulance promotors or the enddy promotors improved the metal recovery from dilute solutions (75). Electrodialysis has been found to be a very useful technique for the recovery of metal salts and the clean water can be reused in the process (76). In a small pilot plant using particle bed electrodes in a single stage and two stage operations 73% and 79% of an initial 22 ppm Cd 75% of an initial 57 ppm Zn and 78% of an initial CN^- could be removed (77). A prototype fluidised bed cell has been reported by Kameltarin for removal of copper at a power consumption of 2970 kwh/ton of copper (78). In order to improve the efficiency of the process of metal removal several newer cell designs such as packed bed (79-81), fluidised bed (82-86). Floating cathode consisting of a perforated tube containing metal particles could be used in separation of Cd from a solution containing NaCN and NaOH and is reported to be less expensive by a factor of > 3 than the conventional methods (86).

Farkas et. al. have reported an electrochemical cell with a C fibre assembly cathode for effective removal of metals from dilute solutions (87). Electrodialysis has been a very useful technique in the recovery of Ni (88-90). High purity Cd has been recovered from drag out losses using an electrochemical cell using fluidised glass beads (91) and a prototype reactor installed to recover Cd and destroy cyanides simultaneously (92). Treatment of pickling waste water recovery of Cu therefrom have been achieved electrochemically (93).

Treatment of waste water containing other compounds

In plating operations several additives are added for mproving the quality and efficiency of the deposition, and t has often been observed that these organic substances interfere with the process of treatment (94). Investigations have been reported in literature regarding the removal or destruction of these compounds using different reactors such as diaphragm type electrolyser (95), packed bed cells with graphite felt electrodes (96) cells with porous electrodes (99) and special RMA cells (97). A two stage electrolysis followed by microbiological treatment has been used in the treatment of waste water containing organic compounds and it was observed that the extent of COD reduction by the biological treatment depended on the pH of the solution during electrolysis (98). Application of high voltage pulse remarkably decreased COD (100 v, 2 Hz max. 20 uA) with Ti anode and SS cathode (99).

Recovery and reuse of treated water

Water management of high order could be attained only when the treated water be reused either for the original process or even for rinsing purposes which will result in considerable savings in water consumption. One of the advantages in the electrochemical methods has been that these do not add to mineralisation of water and with the proper choice of process reuse of water is also possible.

Dimitriev et. al. (100) have reported adoption of electro coagulation using low C electrodes has enabled the treated water to be reusable. Purification and recycling of metal containing effluents through packed bed electrolysers has been reported by Kreysa (101). Combination of ion exchange and electrolysis leads to efficient recovery of metals and allows reuse of water (102, 103). Introduction of a concentrating unit (electrodialysis, reverse osmosis etc.) the rinse water in the drag out tank is concentrated so that it may be used for the replenishment of the process solution without any water overhang (104).

Design of electrochemical reactors

The rate of electrochemical reaction generally depends on the effective surface area as well as availability of reactive species in other words, concentration. In the effluents almost always very low concentrations are met with. This makes it necessary that the best reactor could also be the one with high-space time yield which is partly achieved by increased specific surface area of the electrodes as well as improved mass transfer conditions. These can be achieved by use of 3D electrodes and flow of electrolyte through the same.

Kreysa (105) has reviewed the various special cells such as packed bed cells, porous flow through cells, fluidised bed and solid bed cells, floating cathode cells, pump cell, Eco cell Swiss roll cell and multi cathode cell. The 3D electrodes have extended the application to new possibilities for electrochemical purification of waste gases (106). The design factors in a packed bed reactor for high conversion have been examined and the mathematical treatment of conditions relating to this reactor has been made (107). Fleischmann and Janson (108) have brought about the analogy with an endothermic chemical reaction in a plug flow non-isothermal reactor, in the case of a packed bed electrode with orthogonal flow of current and solution (flow-by electrode).

Treatment of solid sludges

Till recently the disposal of solid sludges obtained either during plating operations or during effluent treatment has not been considered very seriously. But with the increasing quantity of sludge arisal, and the problems associated with the same, treatment of sludges has also been slowly gaining importance. The anodic treatment of the sludge containing Cu and Ni as carbonates in a diaphragm cell could be used for recovery of metal valves (102). The environmental and economic rationale for metal recovery by selective and recycling have been studied (110). The optimum conditions for recovery of Ni from sludges have been worked out (111).

Conclusion

In the foregoing account the possibilities of electrolysis in the waste water treatment and recycling technology has been presented. With the electrolysis, the metal working industries have at their disposal a good alternate recycling and recovery process (112). It has been reported that the PB electrolysis operating at a discharge rate of 1m³/hr per cell could be used for the removal of metal ions as proved by its performance in > 25 installations treating various waste waters (113). As per the data collected from a trial plant treating the effluent from a job plating unit the economics of the RMA process involving electrolytic treatment has been shown to be considerably cheaper taking into account all the costs involved in simultaneous treatment of cyanides, chromic acid and heavy metals (100). In short it can be concluded that the electrochemistry can be a very useful tool in the pollution control in metal finishing industries.

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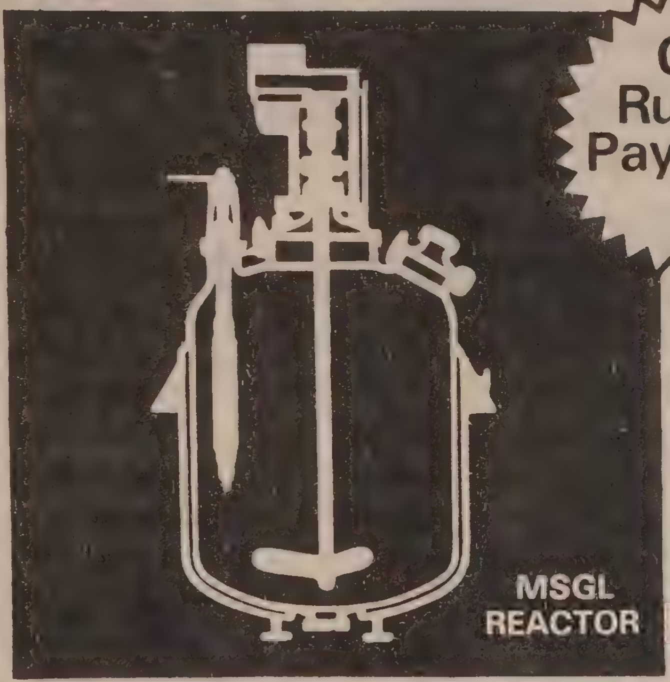

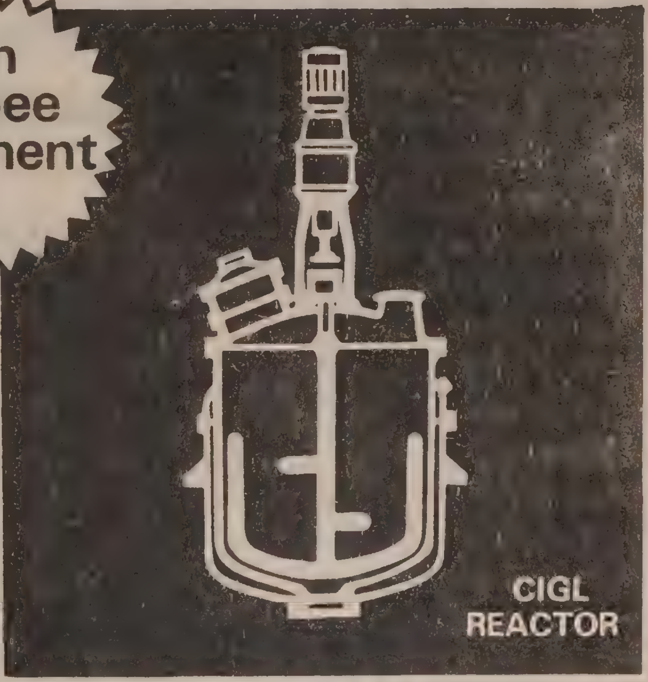

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4-C, Bajaj Road, 201, Dhiraj Kunj, Off Dadabhai Road, Vile Parle (West), Bombay-400 056
Phone: 25-1952, 25-8371 (Office); 632-1032 (Residence)
55, Canning Street, B Block, 3rd Floor, Room No. 67, Calcutta-700 001
Phone: 26-6148, 26-9953 (Office); 31-2108 (Residence)
FACTORY: 103-A, GIDC, Phase-I, Chitra, Bhavnagar. Phone: 5737

Company Notes

DHARAMSI MORARJI CHEMICALS

The following is an extracted from the Chairman's speech:

The performance of the Dharamsi Morarji Chemicals during the fifteen-month period has shown considerable improvement over the previous year, and on an annualised basis, the growth in sales is 27%, and in gross profits it is 45%.

As a result of the satisfactory monsoon, there has been an increasing demand for fertilisers. The performance could have been better but for problems in the receipt of raw materials at Bombay Port during the monsoon period as a result of congestion which not only affected the regular inflow of rockphosphate and sulphur to our plants, but also resulted in payment of heavy demurrage and lighterage charges which are not reimbursed in the retention price to the manufacturers.

As a result of Government's concern about mounting financial burden of fertiliser subsidy, many of the factors referred to in my last year's address continued to affect the profitability of single superphosphate (SSP). However, the plentiful monsoon this year in most parts of the country, coupled with limited availability of DAP, has resulted in a strong demand for Phosphatic fertilisers in general and SSP in particular. As you are already aware, your Company is the largest manufacturer of SSP in the country.

Sale of Chemicals:

The figures of turnover for the first five months of this year indicate an increase of about Rs. 300 lakhs over the corresponding period for the previous year. The whole of the increase is due to higher sales of chemicals. I referred to in my speech last year that we were targetting to enhance the production of chemicals sales from 40% to 60% of the total turnover. This is, therefore, the first step in that direction. The higher sales of chemicals have been achieved by debottlenecking your Company's 620 MT per day capacity sulphuric acid plant at Ambarnath, which has resulted in an increase of 10% in production and also the production of chlorosulphonic acid at Kumhari.

Our further efforts in this direction will be to start the production of Benzene Sulphonyl Chloride and Thiophenol at Roha, for which all the necessary licenses have been received. These two chemicals, besides having local as well as export market, are used in the manufacture of a fungicide, Ediphenphos, which prevents attack of blast on paddy. Since we have received the necessary registration for Ediphenphos we shall take up its manufacture during the next year.

Roha Floods:

Some parts of the Company's factory at Roha were flooded due to very heavy rains on July 23 and 24, 1989. For the first time since the construction of the Company's factory at Roha 12 years ago, the flood waters entered the facatory and washed away some of the stocks of raw materials and finished goods and caused damage to one of the plants. However, efforts put in by our engineers on an emergency basis enabled us to re-start the plant in 10 days.

Future Expansion:

As you already know, the Company had an industrial licence for putting up a sulphuric acid and single superphosphate plant at Amreli, which is a notified backward area in the Saurashtra region of Gujarat State. Since this will be the first major industry of its kind in the district, it has qualified for pioneer status, thus becoming eligible for tax benefits and subsidy applicable to backward areas. I am glad to inform you that this licence is now being implemented, and the single superphosphate plant will be in operation shortly.

As regards the sulphuric acid plant, this should be ready by the end of March 1990. We also intend putting up a Chlorosulphonic acid plant at Amreli for which an application has been submitted to the Government. The total cost of the project will be about Rs. 9 crores and is being financed by a loan of Rs. 5.90 crores from financial institution and our bankers, and the balance from our own resources. This project will increase Company's annual sales by 15% and add considerably to our profits.

As you will notice from the Directors' report, the production of chlorosulphonic acid at Kumhari has stabilised. At the moment, the chlorosulphonic acid produced is being supplied to the existing customers in Western India. Since the plant at Amreli will also be producing chlorosulphonic acid for the Gujarat market, I consider it desirable to utilise a part of our production at Kumhari for the captive consumption in the manufacture of value-added downstream products. A project for the production of Acetyl Sulphanilyl Chloride, an important intermediate for sulpha drugs, utilising the process developed by our Company's R & D Division, is under implementation and I expect the plant to go into production by the middle of nexy year.

I am glad to inform you that only recently, we have been issued a letter of intent for putting up a plant for the production of 1,00,000 tonnes per year of sulphuric acid at Roha, alongwith oleums and sulphur trioxide. A major part of the production at this location will be utilised in our various plants at Roha, and the balance will be sold in nearby markets. According to a recent notification of Government of Maharashtra, the manufacuturing units located in the industrial area at Roha have again become eligible under the package scheme for tax incentives and subsidy. Our new plant will be eligible for the same.

Exports:

During my recent visit to Europe, I have finalised arrangements for the export of Sulfamic Acid to England, Germany and Switzerland. Our present efforts are going to be for the export of about 3,000 tons and this will result in foreign exchange earnings of about $ 2 million per year. Our existing plant which is meeting the local requirements, is now being expanded to meet export requirements, and will be in operation by the end of this year.

Pollution Control:

With the installation of highly efficient scrubbers on the SSP plant at Ambernath, the emission levels of fluorides from the stack were brought down to well below the MINAS standards stipulated by the Pollution Control Board. In the current year it is intended to reduce sulphur dioxide in the stack gases of the sulphuric acid plant. The SO_2 concentration is already within the limits stipulated. However, in order to further reduce the emission level, your Company obtained technology for Alkali Scrubbing of SO_2 from Nissan Engineering Co. Ltd. of Japan, under the Technical Development Fund Scheme. The alkali scrubbing unit is being commissioned this month. This will be the first plant in India to employ such technology and control SO_2 emission to such stringent levels.

GNFC FARES BETTER ON ALL FRONTS

Mr. H.R. Patankar, Chairman, Gujarat State Fertilisers Company, said that the revised retention price which came into effect from March 1, 1988, would adversely affect the new fertiliser plants including the company's coastal DAP plant at Sikka due to lower coverage of depreciation charge of only 5 per cent as against 11% to be provided.

Addressing the annual general meeting of the shareholders, Mr. Patankar said, he was optimistic that the Government would favourably consider the representation of the fertiliser industry including GSFC as the Government was also equally anxious to protect the industry's interest.

He said that GSFC's 15-month turnover including all income had reached around Rs. 700 crores for the year 1988-89, with a total production of 14 lakh tonnes of fertilisers achieving a capacity utilisation of 118%. The fertiliser production would have been much higher if the supply of imported phosphoric acid for the Sikka DAP plant had continued uninterruptedly during the year, he added.

Mr. Patankar further said that the performance of industrial products plant was equally good, as the production of caprolactum, nylon-6 and melamine was higher with a capacity utilisation 104%, 137% and 100% respectively. The polymer unit also turned the corner by showing substantial improvement in production and profitability.

Mr. Patankar said that the performance for the first five months of the current year was extremely good and would be much better than last year if everything went well.

Mr. Patankar assured the farmers that the company's various agro-services and agricultural schemes would be continued for their benefit and said that a mobile soil testing laboratory would soon be launched for Gujarat and Rajasthan. While the development and application of bio-fertilisers pioneered by GSFC had come to stay, a collaborative programme for developing bio-pesticides was taken up with a US company, he said.

He said that GSFC's Rs. 1,300 crore expansion and diversification programme was well on its way and the various projects would be completed by the end of 1992. The detailed engineering work of caprolactum expansion had commenced and all financial arrangements had been properly tied up.

The first phase of the co-generation project was already commissioned with the work on the second phase going as per schedule. Preliminary work on melamine expansion was expected to start shortly. He said that the company had an unpleasent experience of keeping the Sikka DAP plant closed for over four months for want of imported phosphoric acid and therefore it was decided to set up a Rs. 300-crore phosphoric acid plant at Sikka to attain self-sufficiency in this raw material.

He also referred to the company's programme for purifying sewage water for using it in the plant operations as it would ensure a saving of about seven lakh gallons of water per day.

NFL DOUBLES TURNOVER

National Fertilisers Ltd. (NFL) has set up a new record by more than doubling its sales during 1988-89.

The sales touched Rs. 806 crores during the year compared to Rs. 391 crores in the previous year. The quantity of fertilisers sold shot up to 22.82 lakh tonnes as against 11.22 lakh tonnes last year. The company which has declared a Rs. 4.91 crores dividend for the year has identified projects involving an outlay of Rs. 1,373 crores for the Eighth Plan.

During the year, the company recorded a gross profit of Rs. 194.1 crores at pre-revised retention prices against Rs. 99.69 crores in the previous year. With revision in the retention prices, gross profit works out to Rs. 137.61 crores. After providing Rs. 57.71 crores for interest and Rs. 79.9 crores for depreciation, the net operating profit amounts to Rs. 6.85 crores at revised retention prices and Rs. 63.35 crores at pre-revised retention prices. It may be recalled at New Delhi, that since April 1988, there has been a change in the retention price formula with regard to capacity utilisation and depreciation norms.

Units made pollution-free:

All the four units of NFL have been made pollution-proof by installing the atest control systems.

NFL's giant gas-based plant at Bijaipur in Madhya Pradesh, commercially producing nitrogenous fertiliser for the ast one year, has a built-in pollution control and environmental safety system which were incorporated in the plant at design stage itself, NFL managing director S.N. Jain said at New Delhi on October 1.

The three other plants, located at Bhatinda, Nangal (both in Punjab) and Panipat (Haryana), did not have the modern pollution prevention system at the stage of plant erection. With liberal investment decisions, latest anti-pollution systems have been incorporated into these plants, Mr. Jain said.

He said the Nangal plant was producing chemical and complex fertilisers for the last 27 years. Bhatinda and Panipat have completed a decade of commercial nitrogen fertiliser production. Due to high skill maintenance and management, even these plants were producing fertilisers at optimum capacity utilisation levels.

CRL'S RECORD CAPACITY USE

Cochin Refineries Ltd. (CRL) achieved the highest-ever capacity utilisation of 105.8% during 1988-89, against 91.4% in the previous year. It also exceeded its own previous record of 105.2% achieved two decades ago in 1967-68.

The company processed 4.76 million tonnes of crude in 1988-89, the highest output ever achieved against the design capacity of 4.5 million tonnes, and marking an increase of 16% over the previous year.

The company also recorded an all-time high turnover of Rs. 1157.72 crores last year, exceeding the previous year's turnover of Rs. 1032.11 crores by over 12%.

The gross profit earned by the company touched an all-time high figure of Rs. 72.12 crores against Rs. 55.05 crores during the previous year.

SADHANA NITRO

The performance of Sadhana Nitro Chem in the current year is encouraging and assures continuance of the growth trend. During the five months ended August 1989, the company's overall turnover has been Rs. 694.40 lakhs recording 55% jump over the turnover of Rs. 445.92 lakhs during the corresponding period of last year, according to Mr. D.T. Javeri, Chairman of the company.

Addressing shareholders at the annual general meeting on September 26, he said, the company had achieved an export turnover of Rs. 278.52 lakhs during the five months compared to Rs. 120.68 lakhs, recording 130% increase in export turnover. The company had received consent for expansion of its nitrobenzene production capacity from 9,000 TPY to 30,000 TPY.

Negotiations with the world renowned companies were also underway for supply of knowhow for a new project, as diversification. On suitable technical tie-up, means of financing the project would be worked out including rights and/or public issue, keeping in mind the interest of the shareholders, he added.

ZANDU PHARMA

The sales of Zandu Pharmaceutical Works for the first four months of the current year compared to corresponding period of the last year are higher by Rs. 131.09 lakhs. The company hopes to achieve notable growth in the sales and profit during the remaining period of the current year.

According to Dr. C.L. Jhaveri, Chairman, the company's policy of modernisation largely depends on Research and Development aimed at evaluation of new techniques, standardisation of raw and finished materials to preserve all the inherent value of Ayurvedic products together with proper promotion and information to the public, was paying good dividend. Zandu was intensifying its efforts in this direction. This was reflected in the additional investment of plant and machinery amounting to Rs. 138.25 lakhs.

The company's Ayurvedic products were very well accepted by the people and company with its three plants at Bombay, Vapi, Unnao and with an addition of a new plant at Sanjan, were expanding continuously and planning to meet the future growth demand.

The biggest problem the industry faced was that of raw materials availability. The Government should offer incentives for growing medicinal plants and offer land for this purpose to intending entrepreneurs, he said.

No export incentives were given for this non-traditional items with bright future, the chairman lamented.

CHEMINOR DRUGS

Cheminor Drugs Ltd., one of the Dr. Reddy's Group of companies, will enter the capital market on November 6 with an issue of 1,32,500 fully convertible debentures of Rs. 420 each to part finance its Rs. 21 crore project.

The project envisaged the expansion of its production capacity of 600 tonnes of Ibuprofen to 1,200 tonnes, according to Dr. K. Anji Reddy, Chairman of the Dr. Reddy's Group. Speaking to newsmen at Bombay on September 29, Dr. Reddy said the debentures, carrying an interest at the rate of 14% per annum, will be divided into two parts of Rs. 100 and Rs. 320 respectively.

The first part of the debenture of the face value of Rs. 100 will be converted into five equity shares of Rs. 10 each at premium of Rs. 10 each on the date of allotment. Explaining further, Dr. Reddy said the other part of the debenture of the face value of Rs. 320 will be converted into equity shares on December 1, 1991 at a premium to be decided by the Controller of Capital Issues at that time.

Further, Dr. Reddy said the Group with a total turnover of Rs. 50 crore had exported drugs worth about Rs. 15 crore during 1988-89, of which a major portion was accounted by the USA. Now, he said, the Group has planned to double its exports to about Rs. 30 crore in 1988-89. Referring to Cheminor Drugs, he said the company's growth has been geometric and today considered as the largest producer of Ibuprofen in Asia. Ibuprofen is one of the safest pain killers, which is also used as an anti-inflammatory agent and analgesic. From a mere 11.32 tonnes of ibuprofen produced in 1984, Dr. Reddy said, the company produced 553.52 tonnes in 1988-89, recording an increase of nearly 5,000 per cent.

On the future plans of the Group, Dr. Reddy stated that it was very strong in the newest anti-bacterial quinolone drugs like Norfloxacin and Ciprofloxacin of which the Group will continue to expand its sale of formulations as well as bulk drugs. Other bulk drugs on the anvil were, Dr. Reddy said, Diltiazem, a cardiovascular drug, and Gemfibrozil, an anti-cholesterol drug. When asked to state the quantum of intermediates supplied by the Group to multinationals, Dr. Reddy declined to divulge this, stating it was purely confidential matter between his company and the multinationals.

MANUFACTURE OF GRAPHIC ART FILMS: GARWARE PLASTIC PLANS NEW UNIT

Garware Plastic and Polyester Limited, belonging to the Garware group of industries, is setting up a new unit for the production of x-ray and graphic arts films. The investment in the project, to be located at Aurangabad in Maharashtra, is placed at Rs. 58.5 crores. According to an official source, the project was approved against stiff protest from the public sector Hindustan Photo Films and Juggilal Kamlapat Cotton Spinning and Weaving Mills Limited, a private company.

The two companies had argued that there was a capacity constraint in the production of the two proposed items. Secondly, the company's claim of using indigenous technology was not well-established. In fact, Garware Plastic and Polyester Limited, they said, was trying to obtain foreign know-how by employing foreign technicians in its plant. More important, it would not be feasible to export the proposed products, contrary to the claim made by the Garware unit.

Incidentally, the company proposes to make three million sq. metres per annum of X-ray films (polyester based) and three million sq. metres per annum of graphic art films. Of the total cost, the company planned to raise Rs. 25 crores through equity capital (rights' issue), Rs. 21 crore through foreign exchange loans and the balance by way of internal accruals.

The Government approval is conditional to the fact that company should export 25% of its production of the proposed items for at least five years. Secondly, the company has not been allowed to go in for any foreign collaboration.

Responding to the objections, the company had contended that the projected demand for the products by 1993-94 (estimated by DGTD) would be around 23 million sq. metres against a likely capacity of 22 million sq. metres. Even if a capacity utilisation of 80% was assumed, the capacity required to meet a demand of 23 million sq. metres would be 30 million sq. metre

Accordingly, there would be a gap o eight million sq. metres. The compan also explained that its indigenous technology had been approved by th department of science and technolog as also an expert committee which the Government had appointed for the purpose.

Similarly, it was explained that the low cost project should be a matter of pride. In any case, the capital goods components for the project, would be approved separately by the Government depending on indigenous availability.

Likewise, it was explained that the company had no proposal to go in for foreign collaboration. The foreign technicians would come only to install the equipment. In approving the proposed venture, the government on its part contended that it would be possible to export the company's products to the neighbouring countries.

It also felt that there was still a huge gap between supply and demand. Accordingly, it took into account the need for developing indigenous technology.

LUBRIZOL TIES UP WITH US COUNTERPART FOR TECH TRANSFER

Lubrizol (India) Limited, a public sector undertaking, has signed an agreement with its US counterpart for bringing in latest technical know-how for the manufacture of high performance additive components and speciality chemicals at its Turbhe plant in New Bombay.

Lubrizol Chairman, P.K. Rudra told reporters, on September 25, that manufacture of a number of new products like viscosity index improver, pour point depressant, high base phenate, magnesium sulphonate, high molecular weight dispersants and extreme pressure addi-

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tives would be started from early next year. In addition, the company has a plan for manufacturing high purity isobutene, anti oxidants and diverse polymeric chemicals required for treatment of fuels and lubricants.

All these could be implemented during the Eighth Five Year Plan with an estimated capital expenditure of Rs. 80 crores, he said. In 1988-89, net profit was Rs. 7.69 crores compared to Rs. 6.88 crores during the previous year. Sales income rose by 17.47% to reach Rs. 161.16 crores.

Elaborating the company's performance, Mr. Rudra said, the improvement resulted from its strong technological research and development base which helped in getting more and more cost effective solutions during its manufacturing activity. Mr. Rudra said the rise in prices of raw materials, cost of fuel, salaries and wages over the past several years has put the company under pressure to hike the prices of its products.

However, it refrained from passing on the burden to its clients as the company had successfully reduced the cost of inputs, materials and maintained profitability without price increase, he said. Lubrizol is in the business of developing, manufacturing and marketing chemical additive systems which cater to the requirements of modern motor oils, gear oils, automotive transmission fluids and other industrial and marine lubricants.

LI FOR HALDIA PETROCHEM EXPIRES

While the letter of intent (LI) for Haldia Petrochemicals expired on September 30, there was no sign of clearance from the Centre as yet. The West Bengal Government, however, has already sent in an application for further extension of the LI.

The Chief Minister, Mr. Jyoti Basu, had met the Union Finance Minister, in June and was assured that a further meeting would be held in another three months. That period had also expired without any response.

Mr. Basu, who was in Delhi, recently, had remind the Prime Minister about the expiry of the LI of Haldia Petrochemicals in September 30 and was assured that the matter would be studied.

There is a feeling in official circles, however, that the Union Finanace Minister might call a meeting after his return form World Bank-IMF conference in Washington in early October.

EIL TO EXPAND OVERSEAS OPERATIONS

Engineers India Ltd. (EIL) plans to expand its overseas operations by tapping international markets for its services in Iran, Iraq, Abu Dhabi, Bahrain, Kuwait, Oman and South East Asia. The company plans to increase the share of its overseas profits to total profit from 10 per cent to 30 per cent by the end of the century.

Disclosing this at a press conference, Mr. L.K. Chandhok, Chairman EIL, said his company was contemplating to open offices abroad. To start with it will have one office in Abu Dhabi for which formalities were being attended to and the other in Thailand or in Malaysia to cater to South East Asian market.

Mr. Chandhok said EIL was trying to reach out to Thailand where several petrochemical and gas processing projects were on anvil. Recently, a delegation from Vietnam had visited India and EIL was expecting to be commissioned for taking up a project study for a refinery in that country.

In Algeria, Mr. Chandhok said, EIL was in the process of entering into a collaboration with a public sector company to create a joint venture engineering company which would seek to provide whole range of services specially i areas of petrochemicals and oth downstream facilities.

In July, Mr. Chandhok said, EIL ha won a gas pipeline project in Ab Dhabi. This pipeline would bring gas t power and cement projects at Al-Ai town, carried through a total length o 165 km. The service contract, Mr Chandhok said, was worth $2.5 millio to start with.

In all, Chandhok said EIL had i hand overseas business worth $4.5 million spread in five countries. Within th country, the total cost of the 20 projects being executed by EIL was abou Rs. 7,200 crores.

INDU NISSAN MODERNISATIO BY 1990

Mr. D.C. Gami, Chairman, Indu Nissan Oxo Chemical Industries Ltd said the company has initiated action o technology upgradation and modernisation of its existing manufacturing facilities. The programme of expansion an modernisation is expected to be over b 1990. Sanctions of the financial institutions and banks who have lent an advanced term loans to the compan have been obtained. The company in it expansion and modernisation plans hav included, the setting up of a syn ga plant to cater the increase in the suppl of syn gas to match with the increas in the production capacity of oxo alcohol.

Mr. Gami who was addressing th annual general meeting of the shar holders at Baroda said with these pro grammes which were already in progress, the company expected a quantu jump in its production, sales turnove profits and its activities in general. H pointed out that besides the enhance dividend of 5 per cent during the yea the shareholders were also given right during 1989 in the proportion of on rights share for every one equity shar at par.

News from Japan

MASSIVE REFORMS IN INDUSTRIAL STANDARDS REGARDING PAINTS

In the paint industry, under the commission of MITI's Industrial Science and Technology Agency, and with the co-operation of the Japan Paint Inspecting Association, the treatment of paints under the Japanese Industrial Standards (JIS) is to undergo massive revisions after about 10 years, with the aim of maintaining international harmony and putting high added value in paint production, after three years spent revising the original standards.

A revision of "JIS K5400 Paints General Testing Procedures" has already been planned out to conform with the ISO (International Standardization Organization), introducing testing procedures that pass muster for both advanced technology and high quality. With 46 descriptors and 88 item listings, totalling 134 regulations, the JIS for paints are now the most complete standards a single industry has ever had. By way of review from its Japan Industrial Standards Committee, MITI plans to announce the revision during this year, and to put it into effect early next year.

The JIS K5400 regulation, established in February 1959, and revised in 1970 and later in 1979, has remained otherwise unchanged. However, in the meantime, the needs of consumers have increased, and there has been a clamour from experts within the paint industry for change. MITI, taking such circumstances into consideration, decided to review its policy, requesting the industry to review the matter in September 1986.

The Japan Paint Makers Association, seeing the first revision in 10 years, hopes to see a reinvigorated national paint industry, and following from that, eventually, the paint industry's capacity will be re-examined, and business for paints as fine chemical products will be revived.

ETHYLENE PRODUCTION HITS NEW HIGH IN JAN.—JUNE, 1989

The Ministry of International Trade and Industry recently released ethylene production figures for the first six months of this year. According to them, overall prodution reached 2,749,200 tons, marking a historical record. The figure was 13% more than that in the corresponding period of the preceding year. This seems to have been bolstered by favorable demand from derivatives including low-and high-density polyethylene. Thus, annual production this year will very probably top the initial estimate of 5.5 million tons prepared by the petrochemical industry, judging from the fact the figure for the latter half has usually exceeded that for the first half each year. Ethylene production in terms of volume is regarded as a barometer indicating the business climate of the petrochemical industry, and this year, too, the production figure continued to be steady, bolstered by favorable domestic demand and marking a monthly record of 479,000 tons in January. Afterwards, the monthly figure maintained the 400,000-ton level.

The results in the first six months have been complied on the strength of June statistics when monthly production stood at 452,700 tons, up 16% over the same month of the previous year and down 3% from the previous month. Incidentally, the production capacity of the manufacturers concerned is adequate enough to meet their combined production goal as a result of resumption of idled plants and plant expansion by means of modification.

With regard to new plant construction and expansion, on the other hand, the producers involved are discussing related problems with the Ministry of International Trade and Industry so as to start environmental surveys in collaboration with local governments in Chiba and Oita. However, some observers believe the supply-and-demand situation of ethylene has reached a peak from the standpoint of the world-wide ethylene position. It is a bit hard to predict the international supply-and-demand situation.

MITI expects to issue demand estimates for ethylene every 6 months starting with next fiscal year. Furthermore, it is planning to restudy the declaration (prior report) system for plant construction and expansion projects.

STUDY GROUP FOR BIODEGRADABLE PLASTICS IN THE OFFING

Bioindustry Development Center (BIDEC) is scheduled to immediately establish Research Association for Biodegradable Plastics comprising related makers, users and laboratories. BIDEC claims 55 groups have expressed their intention of joining the planned association.

The association will probe into the present situation with regard to R & D for biodegradable plastics and examine their commercial potentialities. In addition, it will advise the government on related industrial policies.

MITI inaugurated last spring feasibility studies on the development of biodegradable plastics. In connection with this, BIDEC sent a survey team to the United States and Europe and compiled a report on overseas moves involving the products.

In this report, BIDEC refers to regulations on plastic wastes implemented in Britain, the States, Belgium and Italy and ongoing development of biodegradable plastics in these countries. It points out that Japan should aggressively promote R & D work for the products by working out technical-development projects.

INT'L PETROCHEMICAL PLAN IN INDONESIA GETS GO-AHEAD

The Indonesian authorities have given official approval to the construction of a petrochemical complex planned by an international consortium comprising Pertamina (Indonesia), Shell (U.S.), C. Itoh and Mitsubishi Corp.

Construction of the complex will be inaugurated next year with completion scheduled for the end of 1993. It will be located near Pertamina's oil refinery built in Java State, Indonesia.

The petrochemical complex will turn out ethylene (370,500 t/y), propylene (220,000 t/y), polyethylene (300,000 t/y), ethylene glycol (125,000 t/y) and polypropylene (120,000 t/y).

Total investment funds needed for the project are estimated to reach $ 1,500 million. Capital funds for the petrochemical complex will be shared 57% by Shell (U.S.), 10% each by C. Itoh and Mitsubishi, 15% by Pertamina and 8% by local interests.

In 1987 the Indonesian government called on Shell (U.S.) to conduct feasibility studies on the project concerned. The U.S. company, together with the two Japanese traders, completed the preliminary studies last March.

ASAHI GLASS TO BUILD UP CERAMICS OPERATIONS

Asahi Glass Co. has mapped out a plan to increase annual sales of ceramics (refractories, etc.) and fine ceramics (functional/structural materials) to Yen 50 billion four to five years hence. In this middle-term business plan, the company aims at stepping up technical development and exploitation of application fields, thus commercializing new products meeting user needs.

With regard to the ceramic business, it intends to scale up castable-refractory operations. To this end, it has completed a production line designed to uniformly blend raw materials at its Takasago factory and plans to establish a special section supervising development, production and marketing of the products.

Demand for castable refractories is increasing conspicuously since they can be shaped into any form on a construction site. The company has the largest market share in Japan for those used for incinerators.

It has been producing and marketing refractories for use in the production of glass, iron/steel, cement and nonferrous metals. By capitalizing on these operations, it has expanded the range of its refractory business to kiln designing, furnace construction and furnace heating.

It envisions building up fine-ceramic operations by adding functional materials applied to peripheral equipment to its business line.

OTSUKA PHARMACEUTICAL BUILDS NEW PLANT FOR BULK DRUGS

Otsuka Pharmaceutical Co. is building a Yen 3.2-billion multi-purpose plant for bulk drugs in an industrial zone located in Saga Prefecture. Start-up of the new plant is scheduled for next May.

Targeted drugs include "Mucosta" anti-ulcer agent and "Arkin" drug effective against cardiac insufficiency. The company has applied to the authorities concerned for production approval on the former. The latter has been subjected to phase-II clinical tests in Japan and the United States.

Production approval will be given to the two products next fiscal year beginning next April. The company has put some 20 items into clinical tests.

It has hitherto produced bulk drugs at its Tokushima factory but the factory has become cramped due to successive construction of new plants on the same site.

The planned plant will have four stories and a total floor space of $4,062 m^2$: it will be staffed with about 30 employees. The plant site concerned is roughly 155,000 ha in area. A laboratory and a manufacturing plant for "Pocari Sweat" sports drink have already been built there.

DAIICHI SEIYAKU ESTABLISHES JOINT VENTURE WITH SANOFI

Daiichi Seiyaku Co. and France's Sanofi S.A. have agreed to establish joint ventures in both Japan and France, the Japanese drug maker announced. The companies are aiming to mutually sell the new drug internationally, and this will be Daiichi's first attempt at establishing a joint venture in Europe, the plan being to set up the joint venture company in Japan in about two or three months.

The agreement calls for the new anti-thrombotic drug to be developed, produced, and sold mutually by the joint venture companies in both countries, and until the new company gets operations fully under way, the two parent companies will be providing a great deal of assistance to the joint ventures in their home countries.

In Japan, after the anticipated two or three months, Sanofi-Daiichi (working name) is to be established in Tokyo, with capitalization of Yen 100 million. Sanofi is to contribute 51% of the capital, the president also coming from Sanofi. In France, Daiichi has contributed 51% for a company of a similar format to be established in Paris.

KAWASAKI STEEL TO START INTEGRATED SILICON WAFER PROD. AT U.S. SUBSIDIARY

Kawasaki Steel Corporation announced that it would build an integrated production plan — including facilities for the processing of 6-inch monocrystals and growing of epitaxial wafers — on the site of NBK (Santa Clara, California), an American silicone-wafer manufacturing company. Kawasaki Steel purchased all the shares of NBK four years ago and since then has established close technical co-operation and continued efforts for market expansion. Moreover, it has also established prospects for mass production of 6-inch wafers. According to the present plan, the Japanese company will establish a structure for annual production of 1,800,000 sheets of mirror wafers (in terms of 5-inch sheet) and 500,000 sheets of epitaxial wafers.

NBK, as already mentioned, is the silicone-wafer manufacturing company Kawasaki Steel purchased in August, 1985. At present it has an annual production capacity of 840,000 sheets of wafers (in terms of 5-inch sheet). Until now it has been endeavoring to improve the quality of its products and rationalize its production techniques. In 1988 it increased its sales to about $10 million. At the present stage, it must check into the possibility of further development.

SUNSTAR INVESTS IN TWO U.S. COSMETICS MAKERS

Sunstar Inc. has invested in La Prairie and Quintessence — major U.S. cosmetics makers — by buying 20 and 5% of their stocks, respectively, for Y 420 and 300 million. The Japanese company thereby intends to build up cosmetics operations throughout the world.

La Prairie is a world-famous maker of skin-care cosmetics of the highest grade, which are produced by blending herb extracts with the placentas of black shepp peculiar to Switzerland. The company has been teamed up with Sunstar for some time and the Japanese company has been exclusively marketing La Prairie's products in Japan. They are scheduled to promote co-operative operations in Japan, the United States and Europe.

With regard to Quintessence, Sunstar envisions taking full advantage of the U.S. company's technology and marketing networks.

The Japanese company aims at increasing earnings by scaling up oral-care cosmetic operations. To this end, it is promoting globalization of business activities through business tie-ups with overseas companies. As a matter of fact, it took over last August John O. Butler Co. (U.S.), thereby acquiring production/marketing bases for oral-care products. In addition, it concluded last spring a cross-licensing contract with Alberto-Culver Co. dealing in toiletries and related products.

New Developments from Japan

AMORPHOUS CARBON PRODUCED FROM POLYCARBODIIMIDE RESIN

Nisshinbo Industries, Inc. has established technology for producing polycarbodiimide (nitrogen-containing aromatics)-based amorphous carbon. The new product has excellent thermal resistance, mechanical strength, flexibility and gas/liquid-barrier properties.

The company has successfully transformed it into ultrathin film having high-level flexibility and strength. The film thickness concerned can be controlled in a range of 10 to 1,000 microns. The curvature of the 10 micron-thick film reaches about 5 mm at maximum.

The company has test-manufactured separators for fuel cells, electrode material and high-temperature heating units from the new product and inaugurated their sample deliveries. It envisions establishing a mass-production system for the new product two years hence.

SILK FIBROIN TURNS SILICONE RUBBER HYDROPHILIC: STUDY

Researchers at Industrial Products Research Center attached to MITI's Agency of Industrial Science and Technology have succeeded in imparting hydrophilic properties to silicone rubber by dipping the product in silk-fibroin solution (concentration: 0.7% for a short time.

When silicone rubber was dipped in the solution, the former absorbed silk fibroin and a 10-nm-thick fibroin film was formed thereupon within one minute. The film became as thick as 10 nm in only five seconds. It hos been confirmed that the surface of silicone rubber coated with 10 nm-thick fibroin film is completely hydrophilic.

When cells were cultured on the surface of silk fibroin-coatted silicone rubber for 50 hours, they propagated at the rate of about 140%: the silicone rubber had been dipped in the solution for less than one minute (corresponding figure for unmodified silicone rubber: roughly 40%). The propagation rate remained at almost the same level when silicone rubber — which had been dipped in the solution for more than one minute — was employed.

Silk-fibroin film does not peel off the silicone rubber concerned when the latter is put in water and physiological saline solution.

The researchers concerned claim that it is also possible to impart hydrophilic properties to polyurethane using the above-mentioned technology and the thereby modified silicone rubber and polyurethane will serve as high-performance medical-use materials designed to absorb cells, encourage their growth and, in addition, have antithrombotic properties.

Silk fibroin has been used in the form of threads for surgical operation for a long time since it has good biocompatibility and can easily be sterilized.

ACTIVE-CARBON FIBRE PRODUCED FROM PHENOLIC RESIN

A research group at Gunma University — together with Gunei Chemical Industry Co.— has developed high-performance active-carbon fibre having a specific surface of as wide as about 2,500 m^2/g.

In a new manufacturing process, "Kynol" phenolic-resin fibre is dried under reduced pressure, dipped in a mixed solution of methyl methacrylate (MMA) and methanol, and subjected to electron beams in a nitrogen atmosphere; homopolymer is removed from the resultant product using a Soxhlet extractor and MMA-grafted "Kynol" fibers with different graft ratios are thereby produced.

The products are carbonized after being heated up to 900°C (rate of temperature rise: 5°C/min.) and held at this temperature for 30 minutes with a nitrogen flow velocity 180ml/ min. The carbonized fibres are transformed into active-carbon fibres after being activated for 40 minutes by means of a mixed gas of nitrogen and water vapour (flow velocity: 450ml/ min.).

In general, the wider the specific surface of the active-carbon fibre, the lower the yield ratio concerned. It has been confirmed, however, that when "Kynol" is employed as raw material, the yield ratio is comparatively high (30-50%) and the specific surface reaches 1,000-2,500m^2/g.

When "Kynol" fibre is carbonized, the polymethyl methacrylate (branched polymer) contained therein is decomposed, thus forming pores in the fibre. The pores allow vapor to disperse within the fibre and uniformly activate it.

Active-carbon fibre has been employed in the form of adsorbing material for use in solvent recovery and electronics/electro-e materials including small-ized capacitors.

MASS-CULTURE METHOD FOR ADHERENT CELLS DEVELOPED

Nitta Gelatin Co. — together with a research group at Dokkyo University School of Medicine — has developed a mass-culture method for adherent cells, primary epithewal-like cells, fibro blasts and suspended cells including hybridomas. The new method helps obtain biological substances using primary adherent cells and propagate the cells themselves.

A collagen substrate — collagen gel coated with calcium alginate — is employed for the new method. The company and the research group selected an appropriate concentric-type double nozzle and put collagen solution with cells suspended in it and alginic acid in the interior and exterior nozzle, respectively. They extruded the two types of solution into calcium-chloride solution through the nozzles. As a result, the alginic acid reacted with calcium ions, thus forming calcium alginate; the collagen became gell and was coated with the calcium alginate. The said cells were thus encapsulated in bead-like culture media.

When insulin-producing cells were cultured using the new method, the cells increased in number by as much as 70 times in 26 days; the secreted amount of insulin reached 165U/ml. in 16 days and 900U/ml. in 28 days. As a result, it was confirmed hat insulin was secreted within he serum-free culture media.

A micro-carrier method has been extensively used for propagating animal cells and obtaining their products. It, however, ften harms the cells and thus is limited to mass culture of conspicuously tough cells.

SUPERHIGH-PURITY SILICON CARBIDE BARED : ASAHI GLASS

Asahi Glass Co. has developed superhigh-purity silicon carbide for use in diffusion furnaces employed for semiconductor production. The new product contains iron at the rate of only 1%, far lower than the corresponding rate for the silicon-carbide ceramics the company commercialized last year.

The new product will be used in the form of liner/process/protective tubes, drawing rods, paddle cantilevers and boats, all of which are applied to diffusion furnaces.

Test pieces of the new product are being tested by user companies. The company is endeavoring to establish related mass-production technology and intends to commercialize the new product during this year.

The domestic semi-conductor industry has hitherto used quartz-based jigs but quartz does not have sufficient resistance against deformation at high temperature when it comes to commercial production of high-density semiconductor products.

It has become increasingly necessary to supply high-strength, high-purity material for use in diffusion furnaces.

In the circumstances, Japanese fine-ceramics makers are are striving to pioneer silicon-carbide products capable of meeting user needs. Asahi Glass developed last year superhigh-purity silicon carbide containing iron impurities at the rate of 3%.

FOUR POLYURETHANE HARDENERS DEVELOPED : ASAHI CHEMICAL

Asahi Chemical Industry Co. has developed four grades of hexamethylene di - isocyanate (HMDI) based curing agent for polyurethane : two grades, THA and TPA, are categorized as the isocyanurate type and the other two, E-402 and E-405, as the elasticity type. All of them have strong weather resistance and good compatibility with polyol.

THA and TPA are trimer of HMDI -- i.e., oligomer having the isocyanuric-ring structure. Polyurethane coating formed using these agents is hardly discolored by heat and has tough weather resistance and good appearance. Potential applications of the agents are paints for car bodies, car repairs, facings of buildings and plastics.

In particular, TPA is conspicuously compatible with low-capacity solvent and can be applied to paints for plastics and repairs of building faces. It is usually difficult to pick out solvent exactly suitable for paints used for the said purposes.

E-402 and E-405 are capable of freely changing the degree of flexibility of polyurethane coating irrespective of the type of polyol acting as one of the main components of polyurethane : they are high-elasticity curing agents produced from special flexible polymer.

Their potential applications are paints capable of forming flexible coating when applied to plastic/rubber/leather products, concrete and buildings. E-405 can also be applied to paints coated on plastic car parts since it has high-level extensibility at a low temperature of —30°C.

MULTIPURPOSE BIOREACTOR FOR TREATING PHENOL WASTEWATER TO BE INSTALLED

Nippon Oil Co. will construct a multipurpose bioreactor (1-t./d. capacity) utilizing methane bacteria for fermenting phenol wastewater from a fluid catalytic cracker at its ,Iegishi refinery. Construction is scheduled to be completed by next summer..

The bioreactor uses aerobic methane bacteria which are immobilized in inhouse-developed polyvinyl alcohol (PVA) as a carrier. Changing the bacteria appropriately, the bioreactor may be used for producing oligo saccharide, the company says.

The company has been endeavoring to commercialize bioreactors under its plan to diversify into the biotechnology- applied field. By operating the bioreactor at the Negishi refinery, the company will continue studies to seek the optimum operating conditions for the reactor, in order to build a commercial-scale plant.

Phenol-wastewater treatment has so far been carried out by means of activated sludge but this method demands large space and treatment of the residue concerned. The new reactor requires far less space and no residue treatment.

The company says the aerobic bacteria is able to live for a long time but a high concentration of phenol in the wastewater could kill it, necessitating a system to adjust the phenol concentration.

NEW NYLON 46-BASED POLYMER ALLOY TO BE PIONEERED : TEIJIN

Teijin Ltd. has begun commercial development of a new polymer alloy using nylon 46 as base. In the plan, nylon 46 will be combined with general-purpose engineering resins such as polycarbonate (PC) and polyphenylene ether (PPE) to produce a new-type polymer suitable for use in automotive parts.

Nylon 46 is a new-type engineering plastic developed by DSM (Holland), having a melting point of 290°C, much higher than those of other nylon resins such as nylon 6 and 66. Three Japanese companies, including Teijin have teamed up with DSM for nylon-46 business in Japan.

DSM is producing the new nylon at the rate of 150 tons a year and is scheduled to complete a 20,000-t/y nylon-46 plant next spring. In Japan, Teijin intends to produce its compound at the rate of 500 tons a year at its Iwakuni factory. The company believes that the new polymer alloy, if successful, will increase consumption of its nylon 46.

Combination with PC will elevate the heat resistance of PC and improve the shock resistance of nylon 46, while combination with PPE will substantially raise the heat resistance and toughness of PPE as well as solve the problem of low hygroscopicity peculiar to nylon resins, the company says.

JAPANESE SCIENTISTS DEVELOP SUPERCONDUCTING LENS

Researchers at Yamanas University have developed high temperature supercondu ing lens that can focus and tra port election beams for use free-election lasers, thermo-n clear research and other hi power instruments.

H. Matsuzawa, head of the re search team in Kofu, Yamanash Prefecture, demonstrated tha when electron beams are injec ted into small apertures of su perconducting lenses, called su pertrons, the self-magnetic fiel of the beams cannot penetrat the lens, owing to the meissne effect. The magnetic field i hence compressed and thereaf ter focuses the electronic beams

Matsuzawa's lens is compose of a hollow cylinder of a bismu th-based superconductor. Whe the electron beam travels thro ugh the center of the cylinde the magnetic field which su rounds the electron beam i squeezed and reacts on the bea to focus it.

The lens is expected to fun tion better for more inten beams, Matsuzawa said.

The researchers were able t observe a focused beam of 2. mm across by traces of neon gas (0.23 torr pressure) left in the vacuum chamber which is ex cited to fluorescence. The fl orescence of neon gas that was excited by single shot electron beam had a total current of 3. kiloamperes and a pulse width of four nanoseconds, the research group said. One nanosecond equals one-billionth of a second

ALL-ROUND PLASTIC LENS FOR GLASSES TEST-PRODUCED

Toray Industries, Inc, has test-manufactured a high-performance plastic lens for eyeglasses using high refractive-index resin. The new product will be commercialized next year.

It is capable of completely cutting off ultraviolet rays and preventing optical reflection, and has high-level resistance against water-induced deterioration of product quality. It has the photochromic effect and is thin and tough.

"Luminus HI" plastic-lens resin has been employed as base material : it is a new-type polymer containing urethane bondings in the molecular structure concerned. It is cast into an eyeglass lens using a glass molding. The refractive index concerned stands at 1.61, higher than the corresponding figure (1.50) for polycarbonate lens, which currently is the dominant type of lens for eyeglasses. It is possible to make "Luminus HI" lenses which are thinner and lighter (roughly 25% in the latter case) than polycarbonate lenses.

The new plastic lens has a 3-layer coating. The base lens — which contains organic material capable of cutting off ultraviolet rays — is, as a first step, coated with hard-coating materials including photochromic material. As a follow-up step, inhouse-developed reflection-preventive material (organic substance) is coated thereupon. This process makes it possible to color the plastic lens concerned at eyeglass stores.

In Japan, demand for plastic lenses for glasses is increasing faster than that for glass lenses. Roughly 60% of the domestic marker for plastic lenses is occupied by three major makers including HOYA. Toray, a latecomer, launched into this business field in 1981 and supplied a total of 2.4 million pieces of the products in 1988.

BRAND-NEW DENTIFRICE REDUCES TOOTHACHE

Sunstar Inc. has inaugurated nationwide sales if inhouse-developed "Delicate Sunstar" dentifrice capable of preventing toothache caused by irritation from outside.

The new product plugs dentinal tubules with unsoluble material — which results from combination of aluminium chlorhydroxy allantoinate (component of the dentifrice) with soluble protein contained in the saliva, thereby preventing exterior irritation stemming from cold water and tooth brushing from reaching dental nerves,

The tooth dentin has numerous tubules, called dentinal tubules, which are connected to the nerves within the dental pulp. It is usually covered by enamel and the gums but bared in the wake of horizontal toothbrushing and shrinkage of the gums resulting from Gingivitis and pyorrhoea alveolaris. As a result, the above mentioned exterior irritation reached nerves through the dentinal tubules, thus causing toothache.

Practical tests on the new product have confirmed that in four weeks it eases toothache resulting from chill and toothbrushing.

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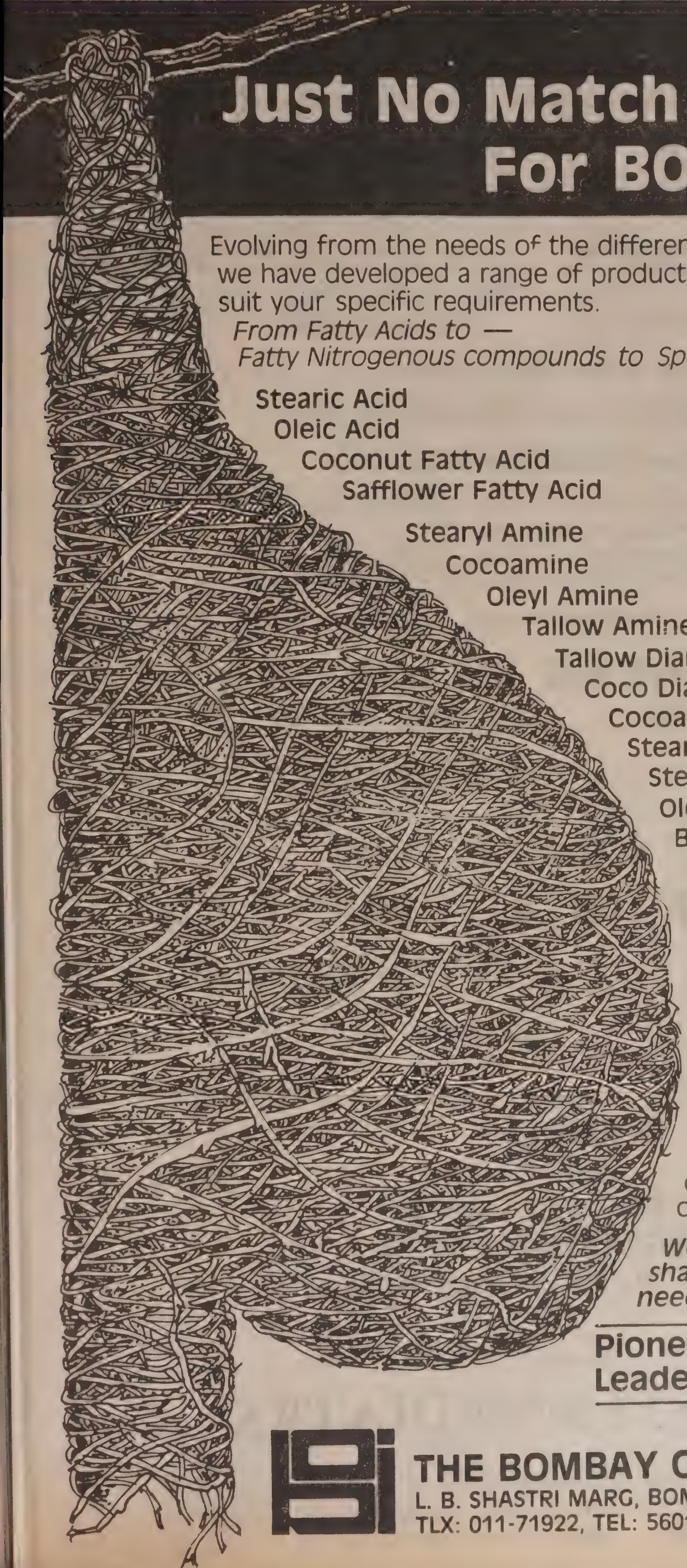

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MARKET INFORMATION

Dyes Exports Show Improvement

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The prices are inclusive of Excise and Maharashtra Sales Tax.

Exports of chemicals and dyes are good. Small scale industries started full production. Intermediates are in short supply. PEG is not readily available.

Polyethylene glycol No. 400 variety has gone up by Rs. 10 to Rs. 72 per kg. Thiourea has gone up by Rs. 3 to Rs. 80. Solvents prices are going downward.

(Prices as on October 4, 1989)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	2.50
Ammonium phosphate (Mono)	14.50
Ammonium phosphate (Di)	14.00
Ammonium carbonate (Di)	17.00
Ammonium bicarbonate	5.60
Ammonium chloride	3.00
Ammonium nitrate	6.00
Arsenic white powder	22.00
Acrylamide (Resale)	74.00
Barium carbonate	6.00
Bleaching powder (33% Cl)	4.20
Borax (Granular)	15.00
Borax (Powder)	15.25
Boric acid (Tech)	28.00
Bisphenol-A	82.00
Butyl carbitol	110.00
Caustic soda (Flakes)	13.00
Caustic soda (Solid)	12.00
Caustic soda (Lye)	10.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	4.25
Calcium carbonate (Activated)	4.75
Cobalt oxide	280.00
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Cream of Tartar (Tech.) China	70.00
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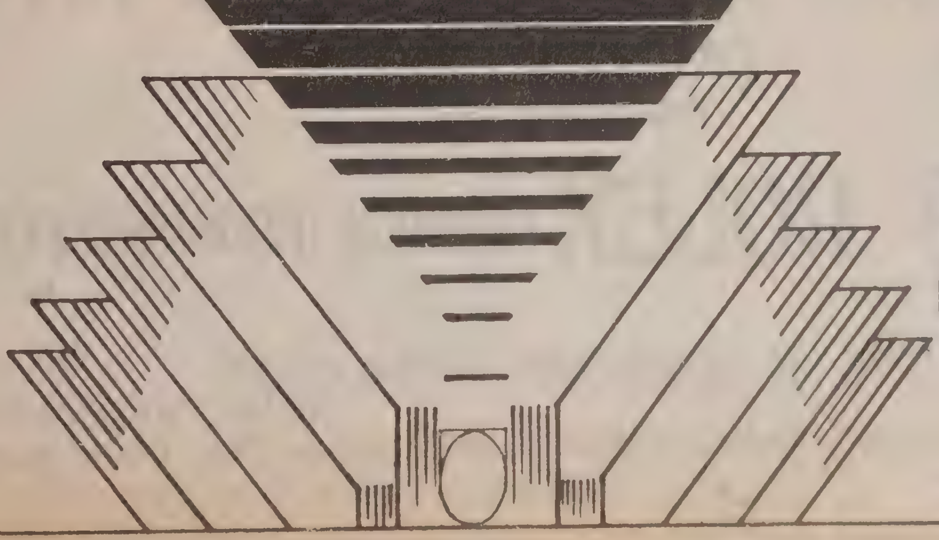

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Menthol crystal cold	700+Ex+ST
Magnesium carbonate (Japan)	16.00
Magnesium carbonate (Indian)	18.00
Maleic Anhydride (Resale)	40.00
Mercury (34.5 Kgs)	12,000.00
Nickel chloride	110.00
Oxalic acid (Resale)	22.00
Peppermint oil (Rectified)	195+Ex+ST
Potassium carbonate (Indian)	34.00
Potassium carbonate (Imported)	33.00
Potassium bichromate	32.50+ST
Potassium phosphate (Mono)	14.00
Potassium phosphate (Di)	14.00
Polyvinyl alcohol (No. 117)	115.00
Polyvinyl alcohol (No. 173)	120.00
Polyvinyl alcohol (No. 208)	150.00
Paraformaldehyde (Resale)	26+ST
Phthalic anhydride 36% (Resale)	25.50
Pentaerythritol (Resale)	45.00
Paraffin wax	20+ST
Rangolite (German)	90+ST
Rangolite (Czech.)	80+ST
Sodium sulphate (Fine)	6.00
Sodium sulphate (Coarse)	5.00
Sodium sulphide 50-52% (Flakes)	11+ST
Sodium sulphide 58-60% (Flakes) (TCL)	20.00
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	680.00
Sodium chlorite 80% (Spain)	88.00
Soda Ash (Tata)	5.00
Soda Ash (Birla)	4.50
Soda Ash (Imp.)	4.50
Sodium bicarbonate	7.50
Sodium bisulphite	4.50
Sodium silicate	3.00
Sodium acetate	5.00
Sodium alginate	250+ST
Titanium Dioxide (Anatase)	110+ST
Titanium Dioxide (Rutile – RCR_2)	150.00
Tartaric acid	100.00
Trisodium phosphate	5.50
Thiourea	80.00
Urea (Tech.)	2.90
Vacuum salt	1.00
Zinc Dust	32.00
Zinc Oxide	52.00
Zinc chloride powder (Tech.)	12.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	14.00
Acetic Anhydride (Resale)	31.50
Acetone (Resale)	20.50
Adipic Acid	70.00
Aceto Acetanilide	55.00
Aniline Oil	70.00
Benzoate Plasticiser	62.00
Butyl acrylate	78+ST
Butyl stearate	50.00
Butanol	35+ST
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	78.00
Chloroform	31.00
Carbon Tetrachloride	20.00
Cellosolve	60.00
Cyclohexanone	56+ST
Cyclohexanol	58+ST
Diacetone (Resale)	34.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG)	43.00
Dioctyl Phthalate	45.00
Diallyl Phthalate	56.00
Dimethyl Phthalate	28.00
Dioctyl Adipate	52.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	26.00
Dimethylamine 50%	30.00
Ethyl Acetate	25.00
Ethyl Acrylate	65.00
Ethylene Dichloride	14.50
Ethylene Glycol	45+ST
Formic Acid (Imp.)	24.00
Formaldehyde (Resale)	7.50
Glycerine (CP)	55.00
Glycerine (IW)	53.00
Hydrogen Peroxide 50% (Resale)	26.50
Isopropyl Alcohol	39.00
Isobutyl Alcohol (Resale)	30.00
Monoethanolamine (Resale)	65.00
Melamine	65.00
Methyl Ethyl Ketone	35+ST
Methyl Isobutyl Ketone	58.00
Methyl Acrylate	60.00
Methyl Dichloride (Resale)	26.00

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Carbitol	68+ST
Meta Cresol	45.00
Nitrobenzene	30.50
Nitric Acid (Conc.) (RCF)	2.50
Ortho Cresol	30+ST
Phenol (Resale)	38.00
Propylene Glycol	55.00
Polyethylene Glycol (No.200)	58.00
Polyethylene Glycol (No.400)	72.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	70.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	110.00
Styrene Monomer	35+ST
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	29.00
Triethanolamine (Resale)	65.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	47.50

SOLVENTS	Per Litre
Benzene	10.80
N-Heptane	10.50
N-Hexane	12.00
Methanol	10.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.00
Xylene	20.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	63.00
Alpha Naphthol (Imp.)	185.00
Aceto Acetic Ester (Methyl)	66.00
Ammonium Molybdate	220.00
Anthraquinone	125.00
Anthranilic Acid	80.00
2-Amino 4-Nitrophenol	145.00
Blue B. Base (Local)	260.00
Beta Naphthol (Atul)	75.00
Benzidine Dihydrochloride (BDH)	98.00
Bromamine Acid	620.00
BON Acid	130+Ex+Ta
Chicago Acid (Atul)	380.00
Coach Acid	58.00
C. Acid (Imp.)	220.00
Cyanuric Chloride	130.00
2,4- DNCB	30.00
Dihydrothio PTOS (Imp.)	1,000.00
Dimethyl Aniline	71.00
Diethyl Aniline	180.00
Diamino stilbene disulphonic acid	165.00
3,3-DCB (Imp.)	180.00
Gamma Acid (Atul)	200.00
H. Acid (Atul)	130.00
G. Salt	79.00
Isophthalic Acid	45.00
J. Acid	365.00
J. Acid Urea	415.00
K. Acid	125.00
MPDS (German)	200.00
MNA	155.00
Meta Ureido Aniline	235.00
MPD (Local)	215.00
MPD (Japan)	240.00
Naphthenic Acid	40.00
N-Methyl J. Acid	600.00
N-Methyl Aniline	150.00
Naphthalene (Refined)	20.00
Ortho Anisidine (OA) (Imp.)	110.00
Ortho Dichloro Benzene (ODCB)	16.50
OT Base	130.00
Para Dichloro Benzene (PDCB)	30.00
Para Anisidine (PA local)	155.00
PNA	118.00
Para Cresidine (Imp.)	400.00
Para Amino Azo Benzene (India)	190.00
PNCB	60.00
Para Amino Acetanilide	200.00
1-Phenyl 3-Methyl 5-Pyrazolone	170.00
Phenyl J. Acid	365.00
Para Amino Benzoic Acid	135.00
PT Base	155.00
Rhoduline Acid	550.00
Resist Salt 80%	28.00
Resorcinol	210.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	82.00
Sulphanilic Acid	50.00
Sulpho Tobias Acid	170.00
Trichloro Benzene (TCB)	22.00
Tobias Acid	165.00
Metanilic Acid	42.00
MTD	120.00

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Bombay Dyes Market

(Prices as on October 3, 1989)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 3BN	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.85
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly. Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc	611.50
Red B 2B Conc	797.90
Red CB Powder	1048.25
Red D2B Powder	589.85
Violet C 4R Conc.	1202.70
Blue BG Conc	580.65
Blue BN Powder	128.20
Blue D 2R Powder	588.25
Navy BT Conc	531.95
Blue B 2G Conc	577.95
Black BT Conc	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269 90
Yellow 3G	473 20
Yellow	140.00
Yellow AL	167 20
Yellow Brown REL	311 70
Yellow FFL	571 40
Gold Yellow GG	320 80
Pink REL	593 00
Red BEL	615 60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449 50
Blue GL	419 00
Blue BGF	805 80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77 75
Fast Orange GC	128 40
Fast Scarlet R	198 05
Fast Scarlet RC	128 40
Fast Scarlet RCR	105 60
Fast Scarlet G	115 75
Fast Scarlet GN	92 95
Fast Scarlet GG	77 75
Fast Scarlet GGS	73 95
Fast Red B	233 50
Fast Red RC	115 75
Fast Red R Flakes	158 80
Fast Red TR	181 60
Fast Red TR Oil	223 35
Fast Red RL	251 20
Fast Red KB Oil	251 20
Fast Bordeaux GP	236 00
Fast Garnet GBC	103 05
Fast Violet B	548 90
Fast Blue BB	566 50

NAPHTHOL COLOURS	Per Kg.
ASG	301 85
AS	205 55
ASSW	379 10
ASBS	253 75
ASBO	264 40
ASD	209 45
ASOL	[illegible]

ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2002.35
ASBT	2459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow MGR	387.65
Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M3R	244.70
Brill. Orange H2R	303.80
Brill. Red H7B	157.95
Brill. Orange M2R	313.15
Brill. Red H8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H3R	333.75
Blue H 5RX	286.20
Navy Blue M3H	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Conc	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Powder Fine	675.30
Blue BC Acra Con Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Powder Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D. Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: SEPT. 29, (NNS) Titanium dioxide anatase dropped sharply by Rs. 5 at Rs. 109 per kg in the Delhi chemical market during the week under review in the absence of demand from paint and plastic units along with increased selling pressure by stockists due to tight money conditions reports NNS. Titanium dioxide K brand and RC-822 came down by Rs. 2/3 at Rs. 100 and Rs. 150 per kg on withdrawal of demand by consumers. RCR-2 titanium also being offered lower at Rs. 150 against Rs. 153. On account of increased offerings by quota holders and poor offtake, mercury fell sharply by Rs. 100 at Rs. 11,200 per flask. In the month of June 89, mercury was quoted at Rs. 12,000. In the absence of demand by stockists, paraffin wax moved down from Rs. 900 to Rs. 880 per 50 kg. In the absence of no enquiry plastic soda flakes softened by Rs. 5 at Rs. 570.

In the wake of negligible demand by stockists and nervous offerings from U.P., menthol bold declined from Rs. 367 to Rs. 360 per kg. After an initial improvement, prices of menthol flake and medium turned easy and drifted lower at Rs. 315 and Rs. 340 at the week-end. Menthol flake Sept. and Diwali delivery declined from Rs. 320 and Rs. 330 to Rs. 315 and Rs. 328 per kg. Mentha oil slipped from Rs. 245/255 to Rs. 220/245 while DMO edged up by Rs. 5 at Rs. 115 per kg. In the absence of comfortable stock position boric acid technical advanced by Rs. 50 at Rs. 1,500 per 50 kg. Hydrogen peroxide softened by 50 paise at Rs. 28 thanks to better supply of imported goods.

Trishul Marka tartaric acid was traded at Rs. 3,250 per 15 kg packing. Citric looked up by Rs. 25 at Rs. 2,200/2,500 per 50 kg due to fall in imports from Indonesia and China in the beginning of the week but later in the face of negligible demand by consumers, prices of citric acid turned easy and quoted at Rs. 2,175/2,475 per 50 kg. Ammonia bicarb remained steady at Rs. 150 per 25 kg owing to sustained demand from Calcutta. No change was recorded in dyes and colours.

(DELHI MARKET RATES AS ON SEPTEMBER 29, 1989)

Ammonia Bicarb (Per 25 Kg.)	150.00	Sodium Bicarbonate (50 Kg.)	290/300.00
Mercury (Per flask)	11,200.00	Sodium Hydrosulphite (Per Kg.)	34.00/3[illegible]00
Soda ash (Per bag)	335/355.00	Rangolite (Per Kg.)	79.00/10[illegible]0
Ammonium Chloride (50 Kg.)	110/180.00	Boric acid Technical (Per 50 Kg.)	1,500.00
Caustic soda flakes (50 Kg.)	570.00	Paraffin Wax (Per 50 Kg.)	880.00
Citric acid (Per 50 Kg.)	2,175/2,475.00	Tartaric Acid (Trishul Per 15 Kg.)	3,250.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	100.00	Borax Granular (Per 50 Kg.)	700.00
		Borax Crystal (Per 50 Kg.)	710.00
Stable Bleaching Powder KCl (Per 25 Kg.)	95.00	Sodium Nitrite (Per 50 Kg.)	700/760.00
		Sodium Nitrate (Per 50 Kg.)	425.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	90.00	Camphor Thal (Per Kg.)	109.00
		Camphor Powder (Per Kg.)	101.00
Stable Bleaching Powder Modi (Per 25 Kg.)	98.00	Menthol Bold (Per Kg.)	360.00
		Menthol Medium (Per Kg.)	340.00

Menthol Flake (Per Kg.)	315.0
Glycerine (Per Kg.)	55/58.0
Sodium Silicate (Per quintal)	275/350.0
Hexamine (Per Kg.)	33.5
Acetic Acid Glacial (Per Kg.)	15.0
Copper Sulphate (Per quintal)	2,400/2,750
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	28.00
Calcium Carbonate (Per Tonne)	2,500/4,000
Acid Slurry Soft (Per Kg.)	28.00
Acid Slurry Hard (Per Kg.)	38.00
Phosphoric Acid (Per 50 Kg.)	1,050.00
Potassium Nitrate (Per quintal)	900/1,200.00
Potassium Permanganate (Per 50 Kg.)	2,800/3,200.00
Sodium Bichromate (Per 50 Kg.)	1,575/1,600.00
Trisodium Phosphate (50 Kg.)	550.00
Titanium Dioxide Anatase (Per Kg.)	109.00
Titanium Dioxide RC-822 (Per Kg.)	150.00
Titanium Dioxide K-Brand (Per Kg.)	100.00
Titanium Dioxide RCR-2 (Per Kg.)	150.00
Zinc Oxide (Per metric tonne)	42,000/52,000.00
Phenol Carbolic Acid (Per Kg.)	37.00
Carbon Tetrachloride (Per Kg.)	24.25
Chloroform (Per Kg.)	28.00
Sodium Sulphate (Per metric tonne)	3,300/3,800.00
Naphthalene Balls (Per 50 Kg.)	1,325.00

DYES & COLOURS	(Per Kg.
Naphthol AS	175/201.65
Naphthol ASG	180/295.20
Naphthol ASBS	210/248.45
Naphthol ASTR	265/360.45
Naphthol ASOL	210/238.60
Naphthol ASBO	195/260.75

DIRECT DYES	(Per Kg.
Black E. Conc.	110/176.90
Diazo Black B.T.	105/147.55
Green B	90/140 55
Blue 2-B	60/101.40
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/235.00
Basic Auramine	55/110.00
Basic Rhodamine	300/425.00
Basic Methylene Blue	100/180.00
Basic Violet	150/180.00
Basic Malachite Green	150/165.00
Acid Orange	75/111.2
Congo Red H/C	75/120.9

Madras Market

Markets were steady during the week. Prices maintained old levels. Sodium cyanide prices went up by Rs. 6 per kg due to increase in prices by indigenous manufacturers.

Though production of toluene at Cochin Refineries has been started as per newspaper reports, there is no let up in the prices as the availability of the commodity continued to be stiff.

(MADRAS MARKET RATES AS ON SEPTEMBER 30, 1989)

Acetic Acid Glacial (per kg)	16.00
Aluminium Sulphate Iron free (per MT)	3,800.00
Ammonium Bicarbonate (per 25 kgs)	125.00
Ammonium Chloride (per MT)	3,000.00
Acid Slurry (per kg)	30.00
Barium Carbonate (per kg)	6.00
Barium Chloride (per kg)	5.25
Boric Acid Technical (per kg)	24.00
Bleaching Powder (per 50 kgs)	215.00
Borax (per 50 kgs)	685.00
Caustic Soda Flakes -- Mettur Chemicals (per MT)	11,800.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,800.00
Calcium Chloride 70% Solid (per MT)	3,000.00
Calcium Chloride Anhydrous (per MT)	5,750.00
Calcium Carbonate (Activated) (per MT)	5,750.00
Calcium Carbonate (Precipitated) (per MT)	4,750.00
Citric Acid (per kg)	48.00
Copper Sulphate (per kg)	24.00
Cresylic Acid 98-99% (per kg)	130.00
Pure Para Cresol 96% (per kg)	85.00
Meta Para Cresol 42% (per kg)	49.00
Formic Acid (per kg)	27.00
Formaldehyde (per kg)	8.00
Glue Flakes (per kg)	15.00
Glycerine (per kg)	46.00
Hydrosulphite of Soda (TCPL) (per kg)	38.00
Hydrosulphite of Soda (IDI) (per kg)	41.00
Hydrosulphite of Soda (BASF) (per kg)	41.00
Hexamine (per kg)	29.00
Hyflo Supercell (per kg)	20.50
Hydrogen Peroxide (per kg)	29.50
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	19.00
Magnesium Chloride (per kg)	3.00
Maleic Anhydride (per kg)	40.00
Menthol Crystals (per kg)	350.00
Oxalic Acid (per kg)	24.00
Paraffin Wax (per kg)	18.50
Potassium Bichromate (per kg)	36.00
Phosphoric Acid (per kg)	24.00
Polyvinyl Alcohol Powder (per kg)	130.00
Pentaerythritol (per kg)	52.00
Phthalic Anhydride (per kg)	28.00
Soda Ash (TAC) (per 75 kgs)	385.00
Soda Ash (TATA) (per 75 kgs)	385.00
Sodium Bicarbonate (TATA) (per 50 kgs)	375.00
Sodium Silicate (per MT)	3,250.00
Sodium Bichromate (per kg)	28.00
Sodium Nitrate (per kg)	8.00
Sodium Nitrite (per kg)	15.00
Sodium Sulphide Flakes (per kg)	12.00
Sodium Bisulphite (per kg)	4.75
Sodium Alginate (per kg)	225.00
Sodium Acetate (per kg)	7.50
Sodium Sulphate (Anhydrous) (per kg)	3.00
Titanium Dioxide (Anatase) (per kg)	105.00
Titanium Dioxide (Rutile) (per kg)	125.00
Trisodium Phosphate (per kg)	7.00
Urea (Technical) (per kg)	3.00
Zinc Oxide (per kg)	54.00
Zinc Chloride Powder (per kg)	12.00
Zinc Sulphate (per kg)	7.00

SOLVENTS

Acetone -- HOCL (per kg)	21.00
Butanol (per kg)	36.00
Butyl Acetate (per kg)	44.00
Benzene (per lit)	17.00
Cellosolve (per kg)	50.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	29.50
Diethylene Glycol (per kg)	47.00
Dichloroethane (per kg)	17.00
Di-octyl Phthalate (per kg)	46.00
Di-N-butyl Phthalate (per kg)	48.00
Ethyl Acetate (per kg)	21.00
Isopropyl Alcohol (per kg)	32.00
Methanol (per kg)	10.00
Methylene Chloride (per kg)	23.00
Methyl Ethyl Ketone (per kg)	38.00
Methyl Isobutyl Ketone (per kg)	55.00
Phenol (per kg)	38.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	63.00
Trichloroethylene (per kg)	25.00
1-1-1 Trichloroethane (per kg)	27.00
Turpentine (per lit)	15.50
Toluene (per lit)	22.00
Xylene (per lit)	21.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
12/10	CMB Effort	C.M.B.	Djibouti; Port Sudan; Jeddah; La Spezia; Valencia; Genoa; Barcelona; Marseilles; Tunis; Casablanca; Tangier; Alexandria; Piraeus; Mersin; Limassol; Felixstowe; London; Liverpool; Manchester; Birmingham; Avonmouth; Dublin and all inland destinations in U.K., Antwerp; Rotterdam; Hamburg; Bremen; Leixoes; Lisbon; Copenhagen; Oslo; Gothenburg; Stockholm; Malma; Aarhus; Helsinki. (Carting at CFS).	14/10
2/10	Arab Mazin (Saudi)	Depe	Aden; Jeddah. (Carting at 4-VD).	13/10
8/10	Pavel Mizekevich (Rus)	Transocean/	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. (Carting at Timber Pond No. 4).	11/10
		I.S.S. Co.	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian Ports via Hamburg. (Carting at Wadi Bunder No. 3).	
6/10	Aries (V-012) (Cyp)	Killick/	Jeddah; Felixstowe; London; Liverpool; Manchester; Bristol; Avonmouth; Leeds; Glasgow; Tilbury; Birmingham; Dublin; Belfast; Rotterdam; Hamburg; Le Havre; Antwerp; Bremen; Bremerhaven; Fos; Valencia; Marseilles; Barcelona. (Carting at M-178/180 Cotton Depot).	13/10
		Merzario/	Jeddah; Hodeidah; P. Sudan; Ravenna; Ancona; Piraeus; Venice; Trieste. (Carting at M.O.D. No. 2).	
		Seaspeed/	Tilbury; London; Felixstowe; Manchester; Liverpool; Avonmouth; La Havre; Rotterdam; Hamburg; Antwerp; Bremerhaven and Scandinavian ports. (Carting at Hay Bunder No. 3).	
		L. Triest/	Jeddah; Trieste; Venice; Ravenna; Rijeka; Naples. (Carting at M-171/173 Cotton Depot).	
		Choice	Leghorn; Marseilles; Valencia; Genoa; Cadiz; Barcelona; Ravenna; Venice; Naples; Trieste; La Spezia and other inland destinations. (Carting at 19-ID).	
11/10	Ramdas (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Le Havre; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Copenhagen; Gothenburg; Helsinki and all inland destinations. (Carting at Timber Pond No. 1).	15/10
6/10	Kalidas	S.C.I.	Chittagong. (Carting at Timber Pond No. 1).	12/10
6/10	Kalidas	S.C.I.	Singapore and other Far East Ports. (Carting at Timber Pond No. 1).	12/10
6/10	Kalidas	S.C.I.	Melbourne; Fremantle; Adelaide; Sydney. (Crtg at Timber Pond No. 1).	12/10
12/10	CMB Effort (NS)	C.M.B.	Dubai; Abu Dhabi; Bahrain; Kuwait; Dammam; Doha. (Carting at CFS)	14/10
2/10	E. Kwiatkowski (Pol)	Khemka	Kuwait; Dammam; Dubai.	15/10
6/10	Aries (V-012) (Cyp)	Parekh/	Muscat; Dubai; Sharjah; Abu Dhabi; Bahrain; Dammam; Kuwait; Baghdad. (Carting at Hay Bunder No. 4).	13/10
		Choice/	Dubai; Dammam; Kuwait; Muscat; Bahrain; Abu Dhabi. (Carting at 19-ID).	
		Merzario/	Dubai; Sharjah; Abu Dhabi; Muscat; Doha; Dammam; Kuwait; Bahrain. (Carting at 14-VD for Merzario).	
		L. Triest/	Dubai; Dammam; Riyadh; Muscat; Abu Dhabi; Doha; Kuwait; Bahrain. (Carting at 171/173 Cotton Depot for L. Triest).	
		Seaspeed	Dubai; Dammam; Bahrain; Kuwait; Doha. (Carting at H.B. No. 5).	
7/10	Al Edreesi (Iraqi)	Al Rafidain	Umm Qaser (Iraq).	12/10
12/10	CMB Effort	C.M.B.	Norfolk; New York; Baltimore; Philadelphia; Charleston; Savannah; Houston; Miami; New Orleans; Via Antwerp; Montreal; Toronto; Halifax. (Carting at CFS).	14/10
8/10	Pavel Mizichevich	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 4)	11/10

1)	(2)	(3)	(4)	(5)
/10	Aries (Voy-012)	Seaspeed/	New York; Baltimore; Norfolk; Savannah; Charleston; Houston and S. American ports. (Carting at Hay Bunder No. 3).	13/10
		Oceanic/	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S.E. Coast and S. American ports. (Carting at Wadi Bunder No. 4).	
		Choice	New York; Baltimore; Norfolk; Savannah; Montreal; Toronto; Charleston; Houston; New Orleans; Miami; Tampa; Chicago and other inland destinations. (Carting at 19-ID).	
11/10	Ramdas (Ind)	S.C.I.	New York; Baltimore; Savannah (Direct) and other inland destinations. (Carting at Timber Pond No. 1).	15/10
2/10	CMB Effort	C.M.B.	Lagos; Abidjan; Lome; Douala; Matadi; Port Gentil; Pointe Noire; Nouakchott; Cotonou; Dakar; Luanda; Monrovia; Tema; Via Antwerp. (Carting at CFS).	14/10
/10	Aries	Seaspeed	West African ports. (Carting at Hay Bunder No. 5).	13/10

VESSELS DUE IN BOMBAY FOR IMPORT DISCHARGE

ue Date	Steamer's Name	Agents	From
1/10	Ramdas	S.C.I.	U.K. Cont./U.S.
2/10	Vishva Karuna	S.C.I.	Constanza

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Materials Imported

MADRAS
(From 25.8.89 to 31.8.89)

ACETYL CHLORIDE: From FRG: Metropolitan Industries, 57.76 MTs., Rs. 14,32,252.

CAPROLACTAM: From Poland: SRF Ltd., 192.5 MTs., Rs. 57,93,640.

CARBOFURAN: From USA: Rallis India Ltd., 9,000 Kgs., Rs. 16,06,576.

COUMARIN: From France: Mysore State Agarbathi Manufacturers Co-operative Soc. Ltd., 2,000 Kgs., Rs. 5,28,869.

4-CYANO PYRIDINE MIN. 98%: From Japan: Pradeep Drug Co., 3,000 Kgs., Rs. 2,20,215.

CYCLOHEXANE: From FRG: Tushar Enterprises, 14,820 Kgs., Rs. 2,09,069.

CYCLOPROPYLAMINE: From Belgium: Dr. Reddy's Labs Ltd., 100 Kgs., Rs. 1,39,055.

DIETHYLENE GLYCOL: From Japan: Tushpur Enterprises, 26,400 Kgs., Rs. 2,19,315.

DIETHYLENE GLYCOL BIS ALLYL CAPROATE: From UK: Macrolens Pvt. Ltd., 4,500 Kgs., Rs. 6,99,712.

EPICHLOROHYDRIN: From USA: SIP Resins Ltd., 32,694 Kgs., Rs. 8,67,249.

ETHOXY METHYLENE DIETHYL MALONATE: From France: Thompson Drugs & Chemicals Ltd., 3,060 Kgs., Rs. 8,32,530.

GUAIACOL: From Japan: Synthokem, 3,000 Kgs., Rs. 2,95,289.

IODINE CRUDE: From Japan: Eskayef Ltd, 3,000 Kgs., Rs. 10,00,978.

ISO EUGENOL: From France: N. Ranga Rao & Sons, 100 Kgs., Rs. 13,330.

ISOPROPYL ALCOHOL: From USA: Birla 3 M Ltd., 2,155 Kgs., Rs. 4,10,276.

LAB CHEMICALS: From Netherlands: Hindustan Photo Films Mfg. Co. Ltd., 12 Kgs., Rs. 55,552; From USA: JB Research Centre, 12.5 Kgs., Rs. 13,182.

LINALOL: From France: Sankaranthi Agarbathi Co., 400 Kgs., Rs. 52,386; From USA: Ambica Chemical Products, 1,089 Kgs., Rs. 1,52,610.

LINALYL ACETATE: From USA: Reliable Indl. Syndicate, 1,089 Kgs., Rs. 1,78,044.

METHYL HEXAHYDROPHTHALIC ANHYDRIDE: From Italy: SIP Resins Ltd., 6,600 Kgs., Rs. 3,53,446.

PROPYLENE GLYCOL JP/USP: From Japan: Uttamlal (Exports), 10,000 Kgs.,, Rs. 2,25,518.

PROPYLENE GLYCOL TECH.: From Japan: Veeyor Formulators, 16 MTs., Rs. 3,52,344.

PYRIDINE: From Belgium: IEL Ltd., 15,200 Kgs., Rs. 9,02,749.

PYRIDINE PURE 2°: From Japan: Siris Ltd., 10.14 MTs., Rs. 6,22,093.

SODIUM METAL: From FRG: Akai Impex Pvt. Ltd., 17.472 MTs., Rs. 3,65,814; Bell Remedies, 9,600 Kgs., Rs. 3,44,336.

SODIUM FORMATE: From Sweden: Tamilnadu Chemical Products Ltd., 90 MTs., Rs. 4,05,396.

TERTIARY BUTYL ALCOHOL: From Japan: Maschmeijer Aromatics Ltd., 12,400 Kgs., Rs. 2,79,273.

TETRAHYDROFURAN: From Japan: Glindia Ltd, 14,400 Kgs., Rs. 4,52,719.

TRIETHYL ORTHO FORMATE: From Japan: Dr. Reddy's Lab. Ltd., 360 Kgs., Rs. 1,12,754.

TRIETHYLENE GLYCOL PURE: From FRG: Darien Electric, 1,100 Kgs., Rs. 41,658.

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PLASTIC MATERIALS IMPORTED MADRAS
(From 25.8.89 to 31.8.89)

HDPE: From Japan: Amman Polysack Pvt. Ltd., 20 MTs., Rs. 3,21,474; Asian Bags Ltd., 10,000 Kgs., Rs. 1,80,581; Karnataka Filatex, 30,000 Kgs., Rs. 4,85,268; Nartan Polymers Ltd., 10,000 Kgs., Rs. 1,74,369; Shri Lakshmi Polypack Inds., 10 MTs., Rs. 1,74,382; Sri Bharathi Knittings, 10,000 Kgs., Rs. 1,75,406; Sumitra Plastics Ltd., 50,000 Kgs., Rs. 7,85,984; Super Polytex Pvt. Ltd., 20 MTs., Rs. 3,32,163; From Singapore: Dar International, 17 MTs., Rs. 2,25,696; Hoysala Blow Moulders Ltd., 16,500 Kgs., Rs. 2,28,473; Integrated Exports, 17 MTs., Rs. 2,05,970; Prima Resources, 850 MTs., Rs. 84,67,185; Rabbani Impex, 5.25 MTs., Rs. 69,707; Ramani Impex, 20 MTs., Rs. 2,65,396; From USA: Rabbani Exports, 47.675 MTs., Rs. 6,35,125.

MDPE: From Sweden: Hindustan Cables Limited, 16.25 MTs., Rs. 4,48,625.

POLYPROPYLENE: From FRG: Pioneer Plastics, 16,000 Kgs., Rs. 2,53,176; From Singapore: ABC Corporation, 160 MTs., Rs. 15,66,461; Swarnarathinam Inds., 16 MTs., Rs. 2,37,565.

MATERIALS IMPORTED BOMBAY
(From 23.5.89 to 28.5.89)

ALDEHYDE C-11: From Switzerland: S.H. Kelkar & Co. Ltd., 4,590 Kgs., Rs. 24,39,162.

ALDRIN TECH.: From Netherlands: Markfed Agro Chemicals, 7,800 Kgs., Rs. 9,19,716.

ADIPIC ACID: From FRG: Hindustan Transmission Products Ltd., 2 MTs., Rs. 41,970.

ACRYLAMIDE: From Japan: G.S.A. India, 15,000 Kgs., Rs. 3,42,258; Hindustan Antibiotics Ltd., 16,060 Kgs., Rs. 3,37,022; Shriji Enterprises, 2 MTs., Rs. 47,208.

ACRYLIC ACID: From FRG: BASF India Ltd., 15,600 Kgs., Rs. 4,76,236.

ACRYLONITRILE: From FRG: Colour Chem Ltd., 12,500 Kgs., Rs. 2,51,420.

ALLYL CAPROATE: From Netherlands: Quest International India Ltd., 550 Kgs., Rs. 1,05,523.

ALUMINIUM OXIDE: From Hungary: Grindwell Norton Ltd., 35,000 Kgs., Rs. 2,57,214; From USA: Grindwell Norton Ltd., 10,000 Kgs., Rs. 7,17,769.

ALUMINIUM SILICATE: From FRG: Berger Paints India Ltd., 12,000 Kgs., Rs. 2,21,604.

ANTIMONY TRISULPHIDE: From Austria: Hindustan Ferodo Ltd., 2,000 Kgs., Rs. 1,56,788.

DL-2-AMINO BUTANOL: From FRG: Lupin Laboratories Ltd., 45,630 Kgs., Rs. 57,15,981.

AROMATIC CHEMICALS: From Japan: Gupta & Co. Ltd., 100 Kgs., Rs. 26,751.

BENZALDEHYDE: From USA: Arlabs Limited, 16,800 Kgs., Rs. 4,29,594.

BETA PICOLINE: From Belgium: Associated Chemical Inds., 3,040 Kgs.,, Rs. 1,67,431.

BROMINE LIQUID: From Israel: Kamal Traders & Contractors, 11,340 Kgs., Rs. 2,87,298; From Netherlands: Bakul Chemicals Pvt. Ltd., 11,340 Kgs., Rs. 2,87,299.

BUTACHLOR TECH. 92%: From USA: Bharat Pesticides Mfg. Co., 15,840 Kgs.,, Rs. 7,41,828.

BUTANOL: From FRG: Goodlass Nerolac Paints Ltd., 4,920 Kgs., Rs. 1,34,469.

CALCINED ALUMINA: From FRG: IVP Limited., 36 MTs., Rs. 5,31,942.

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CALCIUM SILICIDE: From FRG: Haryana Concast Ltd., 500 Kgs., Rs. 1,10,152.

CAPROLACTAM: From Italy: Nirlon Synthetic Fibre & Chem Ltd., 200 MTs., Rs. 61,05,584.

CHLOROPHENYL ISOCYANATE: From FRG: Chemfec Chemicals Pvt. Ltd., 2,000 Kgs., Rs. 2,09,852.

CITRIC ACID MONOHYDRATE: From China: Gobindram Chellaram & Co., 20,000 Kgs., Rs. 3,46,193.

2-CYANOPYRAZINE 99%: From Japan: Indo Pharma Pharmaceuticals Ltd., 400 Kgs., Rs. 2,36,497.

CYANURIC CHLORIDE: From Switzerland: Hickson & Dadajee Ltd., 8 MTs., Rs. 3,69,340.

DIALLYL MALEATE: From FRG: Mafatlal Dyes & Chemicals Ltd., 200 Kgs., Rs. 63,795.

DICALCIUM PHOSPHATE: From USA: Colgate Palmolive India Ltd., 2,30,400 Lbs., Rs. 14,14,306.

4,4 DICHLORO DIPHENYL SULPHONE: From Indonesia: K. Uttamlal Exports Pvt. Ltd., 1,520 Kgs., Rs. 1,89,180.

DICYCLOHEXYLAMINE: From Japan: Bayer India Ltd., 14,400 Kgs., Rs. 4,16,284.

1 DIETHYL AMINO 4-AMINO PENTONE: From FRG: Bec Chemicals Pvt. Ltd., 1,980 Kgs., Rs. 6,44,202.

DIETHYL CARBAMOYL CHLORIDE: From FRG: Burroughs Wellcome India Ltd., 1,710 Kgs., Rs. 1,25,596.

DIMETHYL AMINE: From USA: Gharda Chemicals Ltd., 36,240 Kgs., Rs. 5,84,532.

DIMETHYL SULPHOXIDE: From USA: Pragati Pharmaceuticals Ltd., 90,000 Kgs., Rs. 1,13,299.

1 DIETHYLAMINO 4-AMINO PENTANE: From FRG: Bec Chemicals Pvt. Ltd., 1,980 Kgs., Rs. 1,13,299.

DIETHYL CARBOMYL CHLORIDE: From FRG: Burroughs Wellcome India Ltd., 1,710 Kgs., Rs. 1,25,596.

DIETHYL CARBONYL CHLORIDE: From FRG: Syntholab Chemicals and Research, 1,140 Kgs., Rs. 83,731.

DIETHYLAMINE ETHYL ACRYLATE: From FRG: BASF India Ltd., 510 Kgs., Rs. 41,732.

DIETHYLANILINE: From Japan: Commercial Union Research Labs., 2,090 Kgs., Rs. 1,17,516.

DIHYDROXY QUINOLINE: From FRG: Atul Products Ltd., 640 Kgs., Rs. 2,34,768.

DIMETHYL SULPHOXIDE: From USA: Suchem Laboratories, 2,494.8 Kgs., Rs. 66,739.

N,N-DIMETHYL UREA: From FRG: Bakul Aromatics and Chemicals, 10,035 Kgs., Rs. 4,08,538.

DIOCTYL ADIPATE: From FRG: Caprihans India Ltd., 15.210 MTs., Rs. 3,64,509.

DIOCTYL PHTHALATE: From Italy: Finolex Cables Ltd., 30.750 MTs., Rs. 4,95,980.

ETHOXY METHYLENE DIETHYL MALONATE: From France: E. Merck India Ltd., 7,020 Kgs., Rs. 13,91,884.

ETHYL GLYCOL ACETATE: From USA: Dr. Beck & Co. Ltd., 10,000 Kgs., Rs. 2,31,677.

ETHYL VANILLIN: From France: American Dry Fruit Stores, 300 Kgs., Rs. 1,23,685.

ETHYLENE VINYL ACETATE: From Australia: Novo Furniture P. Ltd., 1,500 Kgs., Rs. 64,733.

GALLIC ACID 98%: From China: Ven Petrochem & Pharma Pvt. Ltd., 1,000 Kgs., Rs. 94,416.

GLICIDYL METHACRYLATE MONOMER: From Japan: IEL Ltd., 400 Kgs., Rs. 45,634.

GUM ROSIN: From China: Blue Bell Polymers P. Ltd., 35.100 MTs., Rs. 2,89,976; From Indonesia: Dujodwala Inds., 50,880 Kgs., Rs. 4,12,335.

HYDROQUINONE: From Italy: Jainson Apparels Pvt. Ltd., 2,000 Kgs., Rs. 1,00,710.

HYDROXYLAMINE HYDROCHLORIDE: From Japan: Bombay Pharma Products, 500 Kgs., Rs. 44,454.

HYDROXYPHENYL GLYCINE METHYL POTASSIUM DANE SALT: From Netherlands: Gujarat Lyka Organic Ltd., 3,500 Kgs., Rs. 11,20,478.

HYDROXY PIVALIC ACID: From FRG: Asian Paints India Ltd., 500 Kgs., Rs. 27,491.

IODINE CRUDE: From Japan: Mehtamine & Metal India Ltd., 1 MT., Rs. 3,14,721; Popular Pharma Chem Inds., 1 MT., Rs. 3,02,919; Pure Drugs India, 5,000 Kgs., Rs. 15,57,868; Santosh Pharmaceuticals, 1 MTs., Rs. 3,08,112.

IRON OXIDE MAGNETIC: From Japan: Jai Electronic Inds. Pvt. Ltd., 3,500 Kgs., Rs. 2,60,385.

ISOBORNYL ACETATE: From FRG: Dujodwala Inds., 50 MTs., Rs. 8,56,376.

ISOBUTYL BENZENE: From USA: C. Well Drugs Pvt. Ltd., 13.657 MTs., Rs. 6,94,150.

ISOPHORONE: From Japan: JBA Prtg. Inks. Pvt. Ltd., 4,940 Kgs., Rs. 1,04,089.

LITHIUM CARBONATE TECH. GRADE: From USA: Dhara Dine Chem. Inds., 2,200 Lbs., Rs. 55,910.

LITHIUM HYDROXIDE MONOHYDRATE: From USA: Hindustan Petroleum Corpn. Ltd., 30,000 Kgs., Rs. 19,87,226.

LITHOPONE: From China: Lalit Impex, 15,000 Kgs., Rs. 1,00,318.

DL-MANDELIC ACID: From Japan: Selecto Chem., 1,000 Kgs., Rs. 1,34,070.

METHANOL: From UK: Lalit Impex, 15,000 Kgs., Rs. 1,00,318.

DL-METHIONINE FEED GRADE: From France: Tarapur Inorganics P. Ltd., 2,500 Kgs., Rs. 1,25,888.

METHYL DICHLORO ACETATE: From FRG: Dymach Pharma 1,320 Kgs., Rs. 50,966; Parag Pharmaceuticals India P. Ltd., 1,320 Kgs., Rs. 50,968.

METHYL ETHYL KETONE: From FRG: Tony Electronics Pvt. Ltd., 36.3 MTs., Rs. 7,36,118.

N-METHYL PIPERAZINE: From FRG: Chemi Pharm Chemicals and Pharmaceuticals, 720 Kgs., Rs. 1,17,853.

MOLYBDENUM DISULPHIDE MOLYFORM: From FRG: ASV Industries, 525 Kgs., Rs. 78,070.

MONOCROTOPHOS TECH.: From Switzerland: Bharat Pulverising Mills Ltd., 16,280 Kgs., Rs. 13,37,021.

MONOETHYLENE GLYCOL: From FRG: Modipon Fibres Co., 55,200 Kgs., Rs. 13,86,507.

MONOISOPROPYLAMINE: From FRG: Win Labs. Ltd. 4,420 Kgs., Rs. 1,09,451.

NOVALDIAMINE: From FRG: E. Merck India Ltd., 1,320 Kgs., Rs. 4,29,468.

OCTAMETHYL CYCLOTETRASILOXANE: From UK: Hico Products Ltd., 13,680 Kgs., Rs. 6,24,280.

OCTYL PHENOL: From Japan: Dai Ichi Karkaria Ltd., 14,000 Kgs.,, Rs. 3,33,101.

PARA CHLORO BENZYL CYANIDE: From Japan: Venkatrama Chemicals Ltd., 4,400 Kgs., Rs. 5,49,577.

PARACHLORO TOLUENE: From USA: Gujarat Insecticides Ltd., 12,247 Kgs., Rs. 3,22,903.

PARA CUMIDINE: From Japan: Montari Inds. Ltd., 60,800 Kgs., Rs. 43,93,584.

PARAFORMALDEHYDE: From Spain: Henkel Chemicals India Ltd., 18,000 Kgs.,, Rs. 1,51,538.

PHENOBARBITONE: From China: Bharat Mercantile Corpn., 1,000 Kgs., Rs. 1,67,662.

PIVALOYL CHLORIDE: From France: Morepen Laboratories P. Ltd., 1,980 Kgs., Rs. 1,32,088.

POTASSIUM BROMATE: From Israel: Unochem Inds., 3,000 Kgs., Rs. 1,92,137.

POTASSIUM CARBONATE: From France: Navin Fluorine Inds., 18,000 Kgs., Rs. 1,77,031.

POTASSIUM FERROCYANIDE: From FRG: Abdullabhai Abdulkader. 10,400 Kgs., Rs. 1,99,659.

POTASSIUM PERSULPHATE: From FRG: PDI Chemicals Ltd., 1,000 Kgs., Rs. 22,817.

PROPYLENE GLYCOL: From FRG: Bharat Laboratory Suppliers, 16.77 MTs., Rs. 3,41,478; From Japan: Wockhardt Ltd., 33,340 Kgs., Rs. 6,87,020; From USA: Rallis India Ltd., 8,385 Kgs., Rs. 1,59,756.

SCHIFF'S BASE: From Italy: Gramon Chemicals P. Ltd., 1,000 Kgs., Rs. 2,57,284.

SELENIUM SULPHIDE USP MICRONISED: From Spain: Abbott Labs. I. Ltd., 1,000 Kgs., Rs. 3,41,944.

SILICON METAL: From Brazil: Metal Overseas, 20.472 MTs., Rs. 3,70,471; From China: Atlas Automotive Components P. Ltd., 19 MTs., Rs. 3,51,307; Emmes Metals Ltd., 40 MTs., Rs. 7,39,594.

SODIUM CYANATE: From Japan: Montari Inds. Ltd., 52,500 Kgs., Rs. 8,59,092.

SODIUM FORMALDEHYDE SULPHOXYLATE: From China: Mihir Chemicals, 16,000 Kgs., Rs. 2,32,894.

SODIUM GLUCONATE: From Japan: Grauer & Weil I. Ltd., 2,000 Kgs., Rs. 48,782.

SODIUM SULPHIDE FLAKES: From China: Chawla & Sons, 34 MTs., Rs. 1,33,755.

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TERPINEOL: From France: Chimanlal Maganlal & Co., 4,000 Kgs., Rs. 1,19,260.

TERTIARY BUTANOL: From Japan: Asia Trade Enterprises, 3,000 Kgs., Rs. 70,732.

TETRABUTYL AMMONIUM BROMIDE: From Italy: Rallis India Ltd., 15,000 Kgs., Rs. 2,07,715.

TETRAHYDRO PHTHALIC ANHYDRIDE: From Italy: Dr. Beck & CO. India Ltd., 10,000 Kgs., Rs. 2,32,107.

TETRAOCTYL TIN TECH. GRADE: From USA: ALA Chemicals Ltd., 2,200 Kgs., Rs. 2,33,680.

TITANIUM DIOXIDE: From Italy: Hardcastle & Waud Mfg. Co. Ltd., 36 MTs., Rs. 14,19,076; From USA: Asian Paints India Ltd., 88,000 Kgs., Rs. 32,54,214; Imkemex India Ltd., 19,278 Kgs., Rs. 7,58,332.

TOLUENE DIISOCYANATE: From Japan: Bharat Foam Udyog Pvt. Ltd., 16 MTs., Rs. 5,46,355; Converter Adhesives & Chemicals, 5,000 Kgs., Rs. 1,76,244.

TRICHLORO TRIFLUORO ETHANE: From UK: Accra Pac (I) Pvt. Ltd., 18,380 Kgs., Rs. 6,19,371.

TRIMETHYL PHOSPHITE: From USA: Sudarshan Chemical Inds., 16,547 Kgs., Rs. 8,53,880.

TIRMETHYLOL PROPANE: From Sweden: Rano Polyproducts P. Ltd., 100 Kgs., Rs. 3,190.

TRIETHYLENE GLYCOL: From Japan: Hico Products Ltd., 16,200 Kgs., Rs. 4,84,355.

XYLIDINE: From Switzerland: Themis Pharma, 1,000 Kgs., Rs. 1,22,224.

MATERIALS IMPORTED BOMBAY
(From 30.5.89 to 31.5.89)

ACETONE THIOSEMICARBAZONE: From Japan: IPCL, 2 MTs., Rs. 5,68,027.

ALDEHYDE C-12: From Japan: Hindustan Lever Ltd., 524 Kgs., Rs. 1,55,019.

D-ALPHA PHENYL GLYCINE CHLORIDE HYDROCHLORIDE: From Switzerland: Ranbaxy Labs. Ltd., 9,660 Kgs., Rs. 33,19,066.

ALUMINIUM OXIDE: From FRG: Mukul Enterprises, 54,000 Kgs., Rs. 5,66,601; Sylvania Laxman Ltd., 120 Kgs., Rs. 21,809; From Japan: Samtel Colours Ltd., 7,000 Kgs., Rs. 3,77,270.

ANILINE OIL: From UK: Polyolefins India Ltd., 6.075 MTs., Rs. 1,49,608.

AROMATIC CHEMICALS: From France: Asian Chemical Works Pvt. Ltd., 200 Kgs., Rs. 1,17,745; From Japan: Industrial Perfumes Ltd., 198 Kgs., Rs. 1,01,261.

BENZALDEHYDE FFC: From Netherlands: Ashok Enterprises, 7,000 Kgs., Rs. 1,86,158.

BIS-METHYL SILYL UREA: From FRG: Max India Ltd., 2,000 Kgs., Rs. 3,10,581.

BISPHENOL A: From Japan: Dr. Beck & Co. I. Ltd., 16,000 Kgs., Rs. 4,40,609.

BROMINE LIQUID: From Netherlands: United Pharma Chem Ltd., 11,340 Kgs., Rs. 2,94,437.

CARBON BLACK: From FRG: Asian Paints India Ltd., 1,800 Kgs., Rs. 2,84,841.

ORTHO CHLORO BENZALDEHYDE: From FRG: Golden Chemical Inds., 2,640 Kgs., Rs. 1,99,443.

PARA CHLORO TOLUENE: From USA: Sumex Chemicals Ltd., 27,000 Kgs., Rs. 3,82,385.

CYANURIC CHLORIDE: From Belgium: Akash Purochem Pvt. Ltd., 1,000 Kgs., 46,167; Anand Dyes & Chemicals, 500 Kgs., Rs. 23,048; Chemiequip Ltd., 2,000 Kgs., Rs. 92,335; Colour & Chemicals Inds., 1,000 Kgs., Rs. 46,167; Delta Hydrocarbons, 500 Kgs., Rs. 23,084; Indu Dyes, 500 Kgs., Rs. 23,084; Janki Dyechem Pvt. Ltd., 500 Kgs., Rs. 23,084; Jay Khodiyar Chemicals, 1,000 Kgs., Rs. 46,167; Kalar Dyechem Pvt. Ltd., 1,000 Kgs., Rs. 46,167; M.K. Soorendi & Co., 1,000 Kgs., Rs. 46,167; Mahendra Dyes & Chemicals Pvt. Ltd., 1,000 Kgs., Rs. 46,167; Ragunath Dye Chem, 1,000 Kgs., Rs. 46,167; Rajsons Chemical Inds., 500 Kgs., Rs. 23,084; Vibgyor Colour Co. Pvt. Ltd., 500 Kgs., Rs. 23,084; From FRG: Aeromax Synthetic Inds., 500 Kgs., Rs. 23,084; Anext Chemical Inds., 500 Kgs., Rs. 23,084; Babron Chemicals, 1 MT., Rs. 46,168; Bhavani Dyechem Inds., 2 MTs., Rs. 92,335; Diamond Dyechem Bombay Pvt. Ltd., 8,000 Kgs., Rs. 3,69,339; Jagsons Industries, 1 MT., Rs. 46,168; K.B. Industries, 1 MT., Rs. 46,168; Keshavlal Talakchand, 12 MTs. Rs. 5,53,008; Prakash Chemical, 4,000 Kgs., Rs. 1,84,670; Swastik Dyechem Inds., 2,500 Kgs., Rs. 1,15,418; Synorg Dyechem, 500 Kgs., Rs. 23,084.

2-CYANOPYRAZINE: From Japan: Vista Organics Pvt. Ltd., 2,000 Kgs., Rs. 11,09,146.

DICHLORO ACETYL CHLORIDE: From Japan: Neston Laboratories, 5,000 Kgs., Rs. 1,74,386.

DIMETHYL ACETAMIDE: From FRG: Rallis India Ltd., 1,140 Kgs., Rs. 31,578.

DIMETHYLAMINE: From Belgium: Bayer India Ltd., 27,300 Kgs., Rs. 3,25,632.

DIMETHYLAMINOPROPYLAMINE: From FRG: Galaxy Organics Pvt. Ltd., 495 Kgs., Rs. 27,008.

DIPOTASSIUM HYDROGEN PHOSPHATE TRIHYDRATE: From FRG: M. Patwari Traders Pvt. Ltd., 500 Kgs., Rs. 46,693.

ETHOXY METHYLENE MALONIC ACID: From FRG: Ipca Labs. Pvt. Ltd., 8,000 Kgs., Rs. 15,61,015.

ETHYLANILINE: From FRG: Chemiequip Ltd., 6.075 MTs., Rs. 1,49,608.

ETHYL GLYCOL: From FRG: Dura Chemical Corpn. Ltd., 5,096 Kgs., Rs. 1,14,640.

ETHYLENE GLYCOL MONOBUTYL ETHER: From USA: C.J. Shah & Co., 13,554 Kgs., Rs. 2,82,194.

FURAZOLIDONE: From China: Bharat Mercantile Co., 1,000 Kgs., Rs. 1,13,299.

HYDROGEN PEROXIDE 50%: From Austria: Excel Inds. Ltd., 40,950 Kgs., Rs. 4,44,630.

HYDROQUINONE: From Japan: C.J. Shah & Co., 4,500 Kgs., Rs. 2,15,977.

HYDROXYLAMINE SULPHATE: From FRG: Apte Amalgamations Ltd., 36,000 Kgs., Rs. 10,12,326.

IODINE CRUDE 97%: From Indonesia: Santosh Pharmaceuticals, 2 MTs., Rs. 5,88,528; Sunil Chemicals, 1 MT., Rs. 2,94,264.

ISOBUTYL BENZENE: From UK: Suneeta Labs Ltd., 6,840 Kgs., Rs. 4,10,482.

ISOOCTYL THIO GLYCOLATE: From FRG: M.G. Chemicals & Oxides, 2,100 Kgs., Rs. 99,420.

ISOPROPYL BROMIDE: From Italy: Hiremath Chemicals Ltd., 4,275 Kgs., Rs. 2,61,014.

L-BASE: From China: Sumedha Chemicals, 1,000 Kgs., Rs. 7,59,264.

2,6 LUTIDINE: From Japan: Penti Synth Chemicals, 185 Kgs., Rs. 43,668.

L-LYSINE MONO HCL: From Japan: Virumed Labs Pvt. Ltd., 300 Kgs., Rs. 32,574.

METHYL CHLOROFORMATE: From FRG: BASF India Ltd., 15,600 Kgs., Rs. 3,55,949.

METHYL PARATHION TECH. 80% MIN.: From GDR: PVS Inds., 16,120 Kgs., Rs. 5,52,191.

MONOMETHYL ACETO ACETAMIDE: From FRG: Hindustan Ciba Geigy Ltd., 77,028 Kgs., Rs. 29,78,338.

MONOSODIUM GLUTAMATE: From Korea: Rallis India Ltd., 18 MTs., Rs. 3,39,898.

NEOPENTYL GLYCOL: From Korea: Goodlass Nerolac Paints Ltd., 2,000 Kgs., Rs. 47,007.

ORTHO AMINO PHENYL ORTHO CRESYL ETHER: From France: Shidimo Interaux Pvt. Ltd., 630 Kgs., Rs. 26,751.

ORTHO ETHYL ANILINE: From USA: Cibatul Ltd., 650 Kgs., Rs. 26,751.

ORTHO NITRO TOLUENE: From FRG: Liberty International Ltd., 43,200 Kgs., Rs. 1,56,354.

PARA CRESOL PURE: From UK: Phin O Chem Inds. Pvt. Ltd., 16,000 Kgs., Rs. 7,33,553.

DL-PHENYL PROPANOLAMINE HCL NF: From Japan: SPA Pharmaceuticals, 200 Kgs., Rs. 94,416.

PIVALOYL CHLORIDE: From France: Ranbaxy Labs Ltd., 3,068 Kgs., Rs. 1,97,674.

POLYVINYL ALCOHOL: From Japan: Dhanamal Export Pvt. Ltd., 2 MTs., Rs. 94,416.

PROPYLENE GLYCOL USP: From FRG: Bharat Lab Suppliers, 16.77 MTs., Rs. 3,41,478.

SELENIUM METAL: From Japan: Metro Exporters Ltd., 1 MT., Rs. 2,97,310.

SODIUM CARBONATE: From USA: Kirloskar Cummins Ltd., 4 Nos., Rs. 34,089.

SODIUM METHYLATE: From FRG: Roche Products Ltd., 9,000 Kgs., Rs. 4,15,507.

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STYRENE MONOMER: From USA: Crystic Resins India Pvt. Ltd., 17,600 Kgs., Rs. 3,66,964; Unibond Inds., 8,800 Kgs., Rs. 1,87,997; Unisets Inds., 8,800 Kgs., Rs. 1,87,997.

SULPHUR HEXAFLUORIDE 99.9%: From UK: Hindustan Brown Boveri Ltd., 1,248 Kgs., Rs. 3,07,337.

TARTARIC ACID BP/USP: From Argentina: Lupin Labs. Ltd., 54,000 Kgs., Rs. 24,81,269.

TERTIARY BUTANOL: From FRG: Sheiraj Chemicals & Pharmaceuticals, 1,550 Kgs., Rs. 40,333; From Japan: Bharat Jyoti, 6,045 Kgs., Rs. 1,37,930.

THIOUREA: From Japan: Somaiya Organo Chemicals Ltd., 1,000 Kgs., Rs. 35,406.

TITANIUM DIOXIDE RUTILE: From Italy: Amrita Plastics Processing, 4,000 Kgs., Rs. 1,58,304.

TITANIUM DIOXIDE POWDER: From Japan: Mishra Dhatu Nigam Limited, 300 Kgs., Rs. 77,116.

TITANIUM DIOXIDE: From Japan: Goodlass Nerolac Paints Ltd., 17,000 Kgs., Rs. 6,74,682; From USA: Asian Paints India Ltd., 30,000 Kgs., Rs. 11,09,391.

TOLUENE DIISOCYANATE: From USA: Industrial Products Mfg. Co., 2,000 Kgs., Rs. 73,960.

TRIMETHYL PHOSPHITE: From FRG: Sudarshan Chemical Inds., 30,947 Kgs., Rs. 11,64,411.

XYLENOL: From USA: Dr. Beck & Co. I. Ltd., 15,200 Kgs., Rs. 3,76,721.

PLASTIC MATERIALS IMPORTED BOMBAY
(From 30.5.89 to 31.5.89)

HDPE: From Czechoslovakia: Associated Brothers, 72.5 MTs., Rs. 7,03,677; Associated Plastic Inds., 25 MTs., Rs. 2,79,582; Darshit Enterprises, 25 MTs., Rs. 2,89,026; Fibre Plast Corp., 275 MTs., Rs. 31,69,842; Hardik Indl. Corpn., 327.5 MTs., Rs. 30,75,402; Hukemchand & Sons, 12.5 MTs., Rs. 1,44,513; Jyemko, 25 MTs., Rs. 2,89,026; Kalpesh Plastic Inds., 12.5 MTs., Rs. 1,44,513; Mehta Traders, 12.5 MTs., Rs. 1,44,513; Naresh Paper Bag, 87.5 MTs., Rs. 9,78,637; Progressive Trading Co., 25 MTs., Rs. 2,69,026; From Japan: Garware Wall Ropes Ltd., 1,00,000 Kgs., Rs. 17,56,609; From Saudi Arabia: Guru Plasto Prints, 17.15 MTs., Rs. 2,98,210; Plastic Processors, 34,300 Kgs., Rs. 5,39,746; Ravi International, 51,450 Kgs., Rs. 8,09,619; Silver Plastochem Pvt. Ltd., 49.5 MTs., Rs. 7,67,250; From Sweden: Hindustan Cables Ltd., 32.5 MTs., Rs. 7,98,265; From USA: Pandya Plastics Pvt. Ltd., 17,500 Kgs., Rs. 3,02,919.

LDPE: From USA: K.N. Holding & Fine Co. Pvt. Ltd., 32.5 MTs., Rs. 6,00,920.

LLDPE: From Saudi Arabia: IPCL, 990 MTs., Rs. 1,59,65,656.

PTFE: From Japan: Space Application Centre, 1,000 Kgs., Rs. 1,85,685; From Belgium: Ami Polymers, 75 Kgs., Rs. 28,924.

POLYPROPYLENE: From Bulgaria: Paharpur Plastics, 203 MTs., Rs. 30,43,849; From Canada: Rajasthan Petro Synthetics Ltd., 15 MTs., Rs. 2,83,249; From Spain: Asia International Pvt. Ltd., 15 MTs., Rs. 2,16,811; Pan Asia Intl. Pvt. Ltd., 30 MTs., Rs. 4,33,622; From USA: Bahudali Plastics (P) Ltd., 15,750 Kgs., Rs. 2,40,402; Paharpur Plastics, 64.625 MTs., Rs. 9,68,829.

POLYSTYRENE: From Korea: ABC Corpn., 100 MTs., Rs. 18,88,325; Khemka Capacitors Pvt. Ltd., 12 MTs., Rs. 3,31,064; Overseas Trading Corpn., 12,000 Kgs., Rs. 3,26,026; Prem Exports, 12 MTs., Rs. 3,26,004; Thermo Guard, 12,000 Kgs., Rs. 3,29,628.

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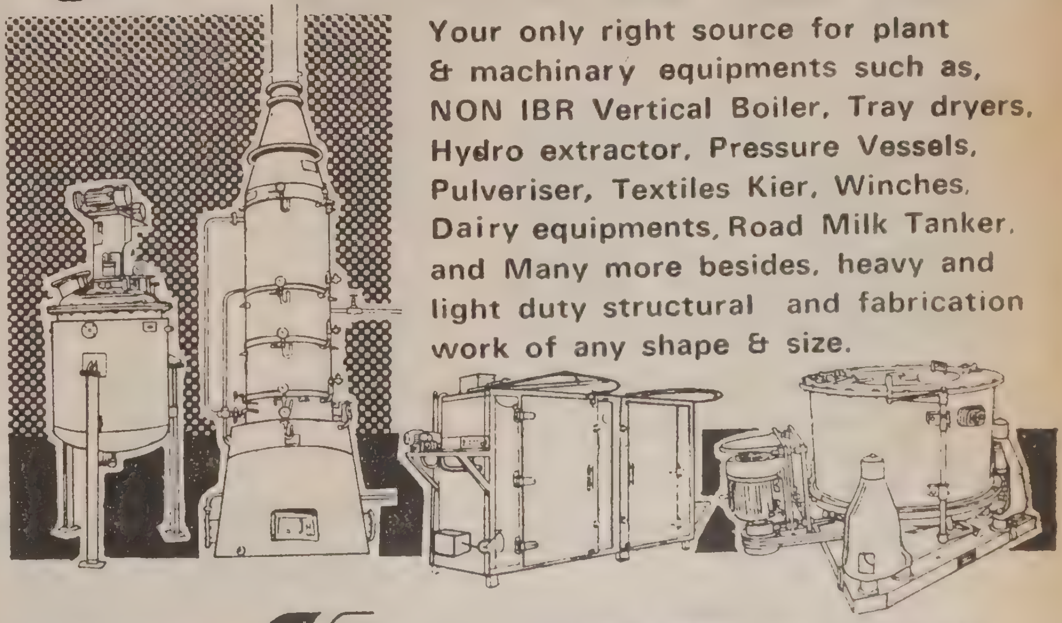

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DYE MATERIALS IMPORTED BOMBAY

(From 30.5.89 to 31.5.89)

DISPERSE DYES: From FRG: Bhuta Enterprises, 200 Kgs., Rs. 93,174; From Korea: Jalan Woollen Industries, 2,000 Kgs., Rs. 97,564.

DRUG MATERIALS IMPORTED BOMBAY

(From 30.5.89 to 31.5.89)

AMINOPHYLLINE BP 80: From China: Tata Exports Ltd., 1,000 Kgs., Rs. 1,40,051.

ETHOSUCCINIMIDE BP 80: From FRG: Parke Davis (I) Ltd., 120 Kgs., Rs. 94,696.

L-LYSINE MONO HCL PHARMA GRADE: From Japan: Rallis India Ltd., 500 Kgs., Rs. 48,781; From Korea: Bombay Pharma Products, 1,000 Kgs., Rs. 98,507.

D-PANTHENOL USP: From Japan: Lupin Labs Ltd., 500 Kgs., Rs. 1,38,241.

PHENYTOIN USP 100: From USA: Parke Davis India Ltd., 210 Kgs., Rs. 1,31,711.

PHENYTOIN SODIUM IP: From Italy: Parke Davis India Ltd., 1,000 Kgs., Rs. 2,14,049.

PROMETHAZINE HCL BP: From China: K. Seventilal & Co., 500 Kgs., Rs. 2,13,389.

MATERIALS IMPORTED BOMBAY

(From 1.6.89 to 7.6.89)

ACETO ACETANILIDE TECH.: From FRG: PDI Chemicals Ltd., 1,000 Kgs., Rs. 1,72,079.

ACRYLAMIDE: From Japan: M.K. Soorenji & Co., 1,020 Kgs., Rs. 25,681; Natwar Textile Processors Pvt. Ltd., 1,000 Kgs., Rs. 23,604; Navrang Dyeing Pvt. Ltd., 1,000 Kgs., Rs. 23,604; RSA Polymers, 6,000 Kgs., Rs. 1,51,066; Texchem Industries, 1,000 Kgs., Rs. 23,604.

ACRYLIC ACID: From Japan: BASF India Ltd., 16,000 Kgs., Rs. 4,98,518; Thermax Pvt. Ltd., 16,000 Kgs., Rs. 4,72,038.

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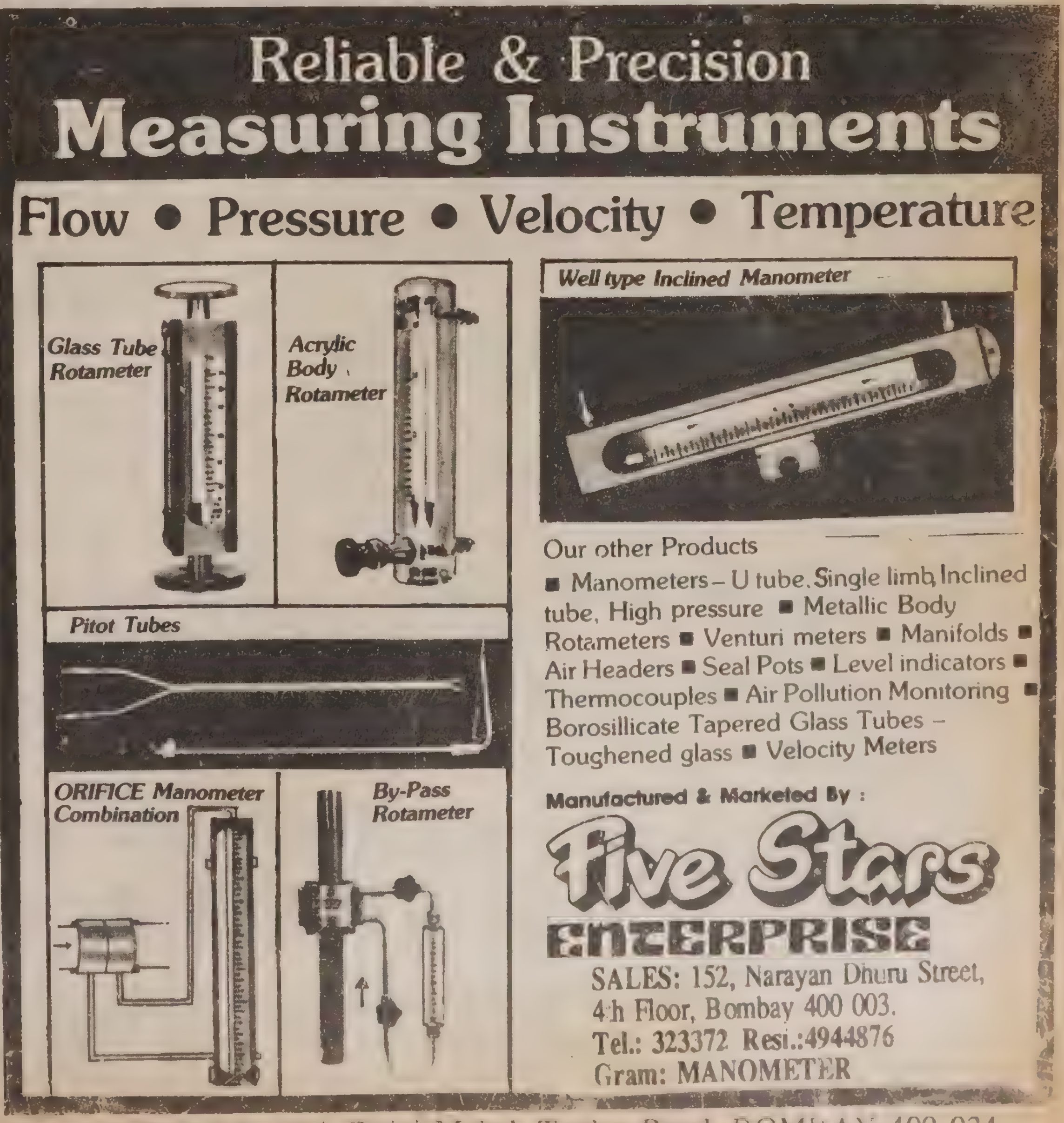

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